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VOL. LXXII MAY 21, 1955 No. 1871

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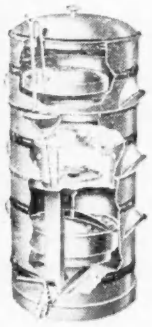

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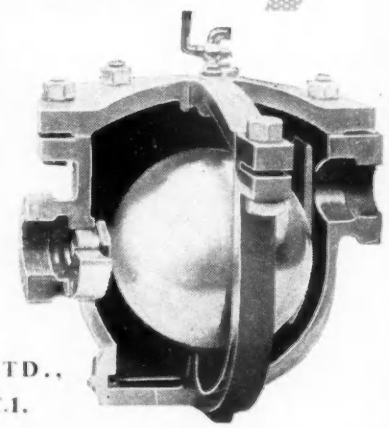

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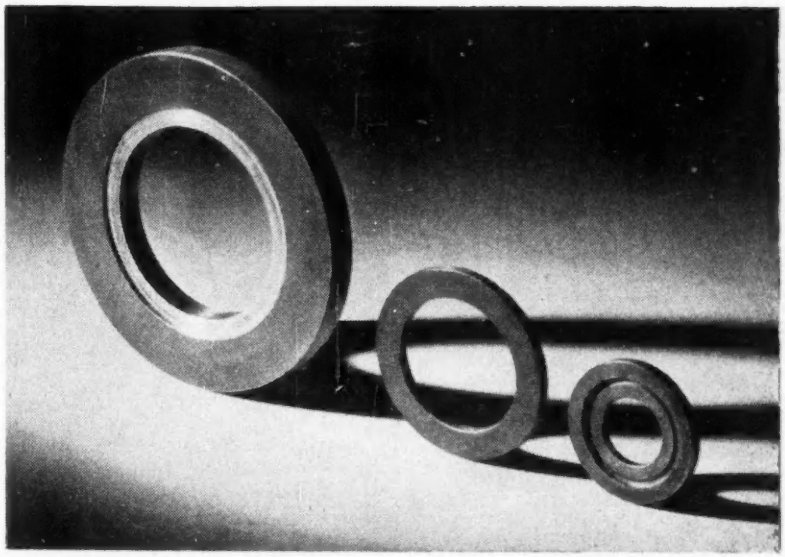

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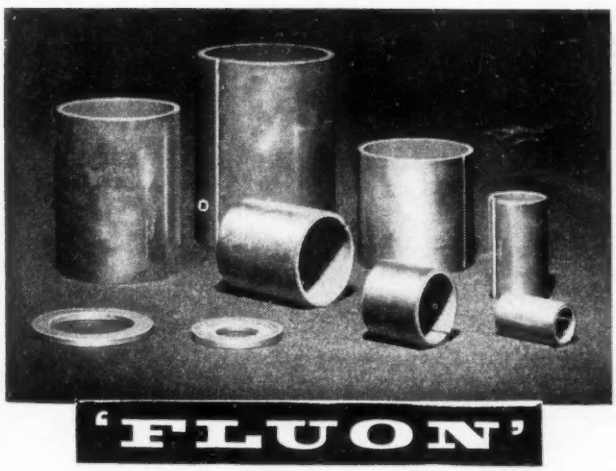

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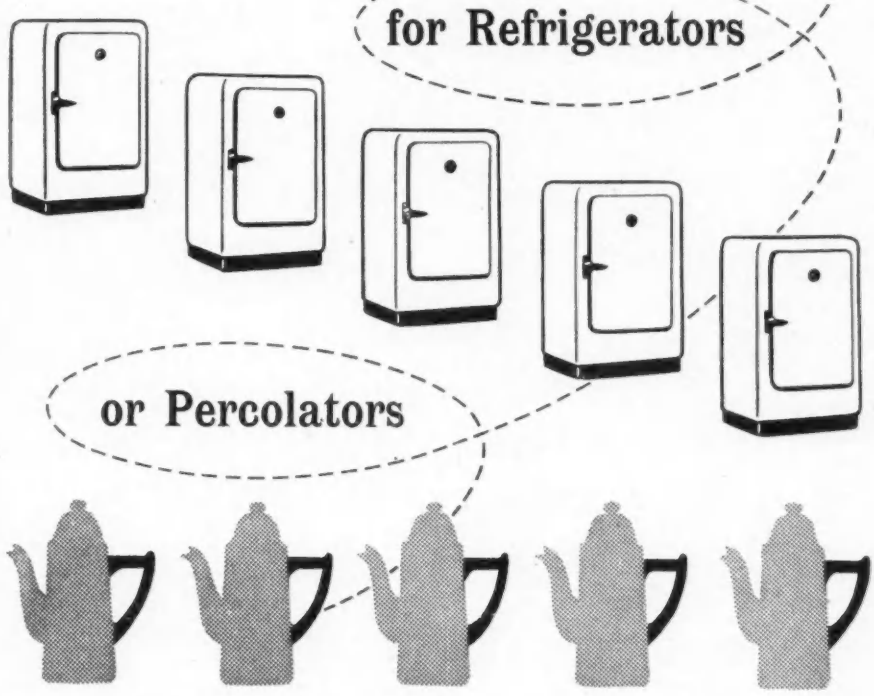

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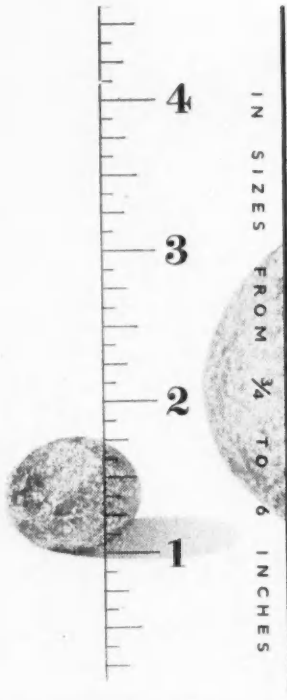

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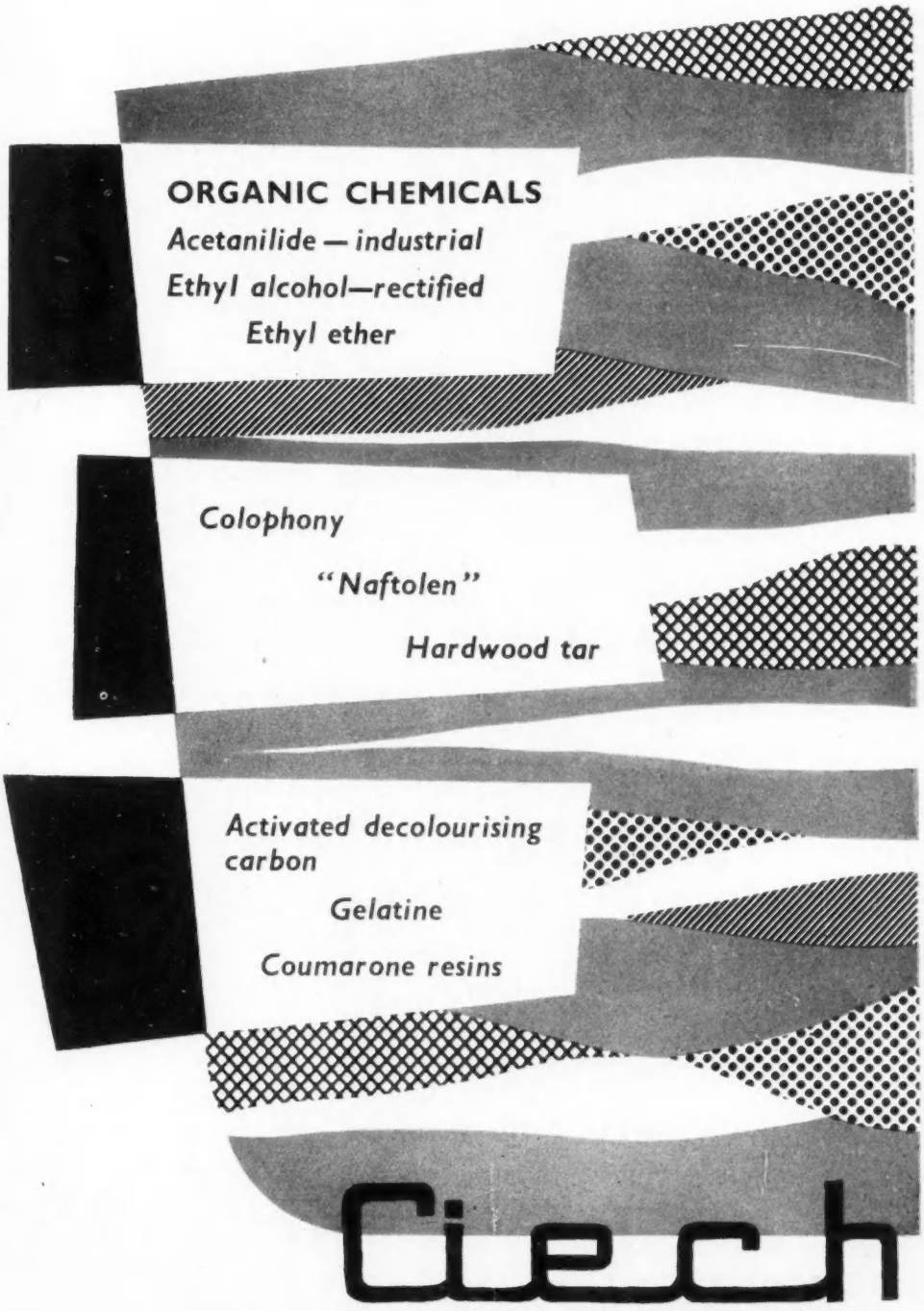

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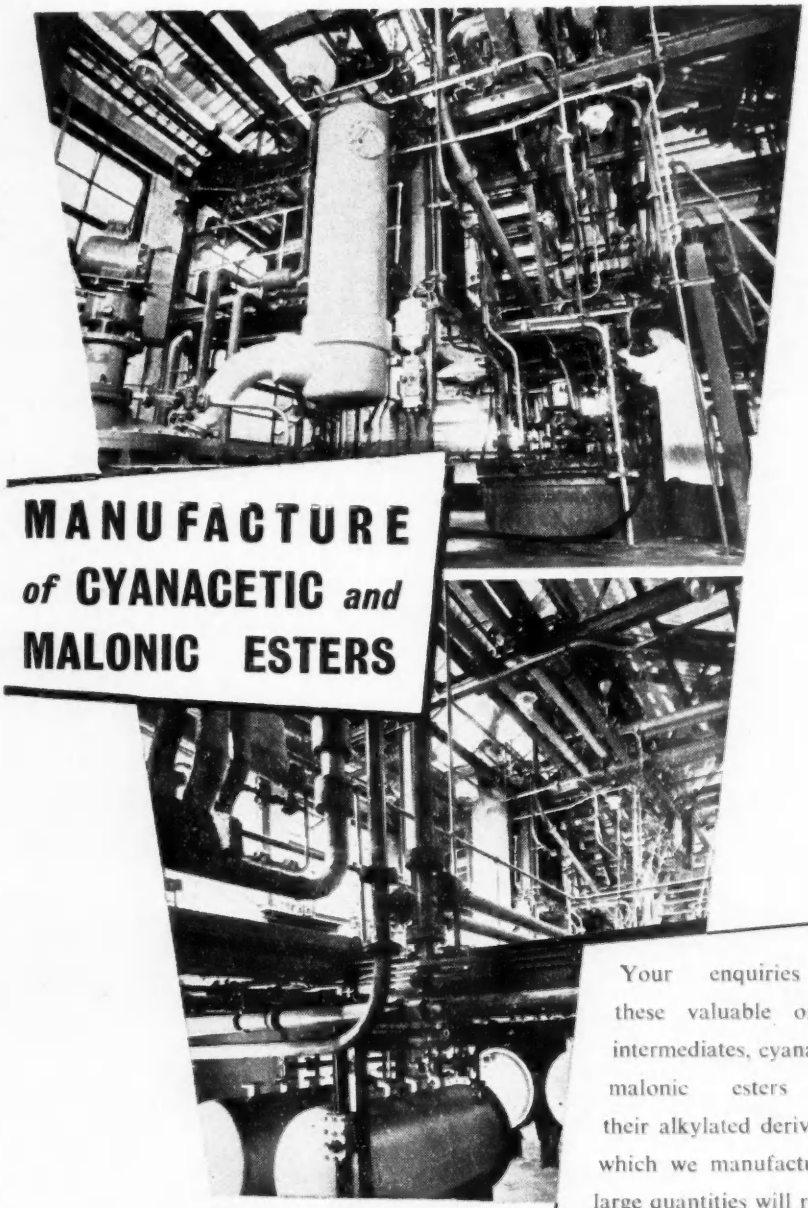

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The Chemical Age

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CONTENTS . 21 MAY 1955

Big Increase in I.C.I. Sales	1135
British Rayon Research	1137
Albright & Wilson's Annual Report	1140
Freedom for Plant Manufacturers	1141
Titrations of Anhydrous Solvents	1143
Chemical & Dyestuffs Traders' Association Annual Meeting	1149
Oil Equipment in Europe	1151
Achema XI	1152
Italian Fibres	1153
Home News Items	1155
Overseas News Items	1156
Personal	1157
Publications & Announcements	1159
Law & Company News	1162
Next Week's Events	1164

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CH 114 A

Chemicals & Weeds

EVERY chemist who is also in private life a gardener will appreciate that no subject more topical could be discussed in May. Crops are retarded by late frosts, checked by droughts, defoliated by birds, or sapped by insects, but year by year the weeds flourish. Various estimates have been made of the farm crop losses that can be directly attributed to weeds. They range from 10 to 40 per cent. It has been conservatively estimated that farmers in the State of Iowa lose $50,000,000 a year to weeds! An old-time estimate for the loss to British agriculture put the annual figure at over £16,000,000; with changed values over 40 years the figure has risen to at least £50,000,000.

Until comparatively recently weed control involved hard manual labour in the garden and combined manual and mechanical labour on farms. It was reasonable to expect certain substances to be able to poison preying insects or parasitic fungi without also poisoning crop plants, but weeds and crops are similar forms of life. Selective poisons for weeds seemed as remotely practical as any of the alchemists' dreams. Chemicals could be effectively used on paths or courtyards where no vegetation of any kind was desired, but this 'wholesale' type of clearance is scarcely to be classified as weed control at all. It is weed control only in circumstances when every type of plant can be defined as a weed because it happens to be 'out of place'. The use of chemicals for selective weed control belongs almost entirely to the twentieth century.

In 1896, Bonnet of France introduced copper sulphate solutions as sprays for cereal crops; the spray was retained by the broad-leaved charlock plants, but it ran quickly off the upright, narrow-leaved cereal plants. For many years this simple botanical distinction has been the basis of chemical weed control. Again in France, sulphuric acid was introduced in place of copper sulphate; in the first eight years of its use in Britain, the acreage sprayed with this acid rose from 300 to 30,000. The fact that this method developed so extensively despite obvious problems associated with a powerful acid as a farm material is itself proof of the economic value of any effective means of weed suppression. The slight check given to the crop was overwhelmingly outweighed by the benefits of removing competition with close-growing weeds.

The next stage in the development of selective weed control was the introduction in the 1930s of dinitro-orthecresol, better known in agriculture as DNOC. Here again, France has the credit of discovery. Here, too, the principle of selectivity was the greater retention of the spray by broad-leaved weeds. As little as 6 to 8 pounds per acre of the active ingredient was sufficient. However, DNOC is a cumulatively toxic

substance to humans, especially in hot weather, and it is also inflammable. Its use on huge acreages despite these disadvantages again demonstrates the economic value of chemical weed control.

It was in 1940 at Jealott's Hill Research Station (I.C.I.) that selective weed control was revolutionised. Research in the late '20s and '30s had developed the first synthetic plant-growth substances. The idea that organic 'plant hormones' might be developed also as weedkillers had not been visualised until it was noticed in the course of an experiment that a spray based on alpha-naphthyl-acetic acid completely suppressed germination of charlock seeds without effect upon oat seeds. From this semi-chance parentage the now widely-used selective weedkillers, MCPA and 2,4-D (2-methyl-4-chlorophenoxy-acetic acid and 2,4-dichlorophenoxy-acetic acid) were born. These new synthetically producible chemicals had great advantages —the rate of dosage per acre was very small, they were non-toxic and without handling hazards, and they could be used on grassland as well as on cereal crops.

A recent estimate puts the total cost of spraying MCPA at 25s. per acre. Years of field tests at Oxford have shown that the yield of grain is increased by an average of 23 per cent if weeds are controlled by MCPA. At current prices and current yield averages, this means that the values of extra wheat, barley, and oat grain per acre are £6 15s., £5, and £4 5s. These returns on an expenditure of 25s. per acre show respective profits of 440, 300, and 240 per cent. They are handsome dividends indeed, yet the British cereal acreage that is treated with MCPA or 2,4-D is still much less than half.

Experience has shown that certain weeds are fairly resistant to MCPA or 2,4-D, that oats are often damaged by 2,4-D but not by MCPA, and that clovers, which may be in pasture or undersown with cereals, are likely to be markedly checked. This has created specific tasks in which MCPA is preferable to the slightly cheaper 2,4-D, and it has left a sector of cereal weed control in which DNOC is still superior, e.g., when the most dominant weeds are resistant to MCPA or 2,4-D. But all these limitations are minor enough when set beside the great overall advance that hormone-type selective weedkillers have brought.

Nor is the story of progress likely to rest at this stage. Weed control on the farm is only partially secured by chemicals whose use is limited to cereal crops and grass. Broader-leaved crops are as susceptible to MCPA and 2,4-D as weeds themselves. DNBP or dinitrobutyl phenol, similar in action to DNOC, has been introduced for weed control in peas, clovers, lucerne, and several other crops; if used when weeds are young and small, it is effective, but more experience under a variety of conditions is needed before the true place of this new weedkiller can be assessed. At Wye Agricultural College, MCPB, a phenoxy butyric substance, is being promisingly developed, and it may replace MCPA in applications where there is some risk of damage to clovers. For killing woody vegetation, 2,4,5-T (2,4,5-trichlorophenoxyacetic acid), another hormone-type weedkiller, is already extensively used in America.

However, the hormone-type substance that can achieve a good range of weed control without damaging a wide range of crop plants has yet to be found, and perhaps it is too much to be hoped for. The physical difference between broad-leaved and narrow-leaved plants still rules this trace-biochemical method of weedkilling—the broader foliage absorbs the greater 'dose', the susceptible growing-points are less protected. The better prospect seems at present to be found in using hormone-type substances as pre-emergent weedkillers, developing the required selectivity of effect in the difference between action upon crop germination and weed germination; but it is still not much more than a prospect.

So far as chemical production is concerned, British interest in this modern field is by no means limited to the home market. Exports of weedkillers in 1954 nearly doubled their average value for the two preceding years. At least £750.000 is being earned per annum by weedkillers sold overseas, and much of this sum seems attributable to exports of MCPA or 2,4-D. Some manufacturers are said to be exporting 90 per cent of production.

Notes & Comments

'Abstract Economics'

NEARLY two years ago (see THE CHEMICAL AGE, 1953, **69**, 167) we suggested that America's *Chemical Abstracts* would run into the same kind of economic crisis that was at that time creating dire emergency for *British Abstracts*. Events seem to have caught up with prediction, for it has recently been announced that the American Chemical Society Council has officially designated *Chemical Abstracts* as a service and not merely as a journal. The loss incurred by *CA* in 1954 was $325,000; this is expected to rise to about $500,000 for 1955. So far, these budget deficits have been balanced by allocations from ACS subscription revenue and from 'funds provided by corporate associates'; presumably this latter phrase refers mainly to grants from industry. These subsidies can no longer be expected to balance a widening gap between *CA* income and costs of production. In seven years the number of abstracts per year has risen by 88 per cent; this, together with higher costs of printing, etc., has raised *CA* production cost by 131 per cent.

Variable Charge

BY defining *Chemical Abstracts* as a service, the ACS can in future avoid the limitation of having a predetermined subscription price. A variable charge will be possible and this will be based upon actual costs. The aim will be to keep total revenue and costs in balance, without deficit or profit. There will, however, be a widely differential system for charging on a costs basis. Individual ACS members will be charged the bare costs of paper, printing, and delivery, an annual charge that is estimated at about $20 per year. Teaching institutions will pay an annual charge calculated by dividing total costs by number of copies printed, estimated at about $80 to $100 per year. All other purchasers will pay a charge covering the balance of production costs and costs of service improvement research, and for this the estimated figure is from $350 to $375 per year! The difference between $20 and $350 per year is only mildly describable as staggering!

The Cost to Britain

THE scheme shrewdly covers the ACS from the usual effects of sharply increased subscription charges; for, if circulation falls, the extra costs per volume can be passed on to those who still subscribe. At the same time the individual members, by having to meet such a limited part of the total costs, will enjoy a protective time-lag against further cost-raising consequences. It is a bold scheme and, if it succeeds, it will put *Chemical Abstracts* on a permanently self-supporting footing. Overseas subscribers will in future be paying a very full price for this American service—they will be among those who have to pay more than their proportionate share of the full costs. The question that leaps into the mind now is surely this—could this highly differential system of charging have been introduced if *British Abstracts* was still being published in a similar and competitive form? When we pleaded for the continuation of *British Abstracts* some critics said that the existence of *Chemical Abstracts* made our own abstracting service unnecessary. What will each year's issue of *CA* cost now? And how will the total flow of dollars involved compare with the sterling sum that would have enabled *British Abstracts* to continue appearing in their old and established form?

Of Good Report

IF company reports as well as films and film-stars received Oscar awards, the recent annual report for the US company, Diamond Alkali, would be well in the running. Without being cumbersome in size or presentation it satisfies all types of opinion as to the kind of information that companies should give their shareholders. Those who want nothing more than accountancy's final story of figures will at least appreciate the typographical layout of the various statements, with 1954

figures in bold black and comparative 1953 figures in a faint, yet clearly readable, grey. In addition profit figures and statements of assets and liabilities for every year since 1954 are given in historical, tabular form. The Board's 'Letter to Stockholders' is a 6-page affair of straightforward reportage and commentary. It avoids any suspicion of window-dressing on the one hand or of needless secrecy on the other. It stresses two major trends in Diamond Alkali policy, decentralisation for management and steadily increasing expenditure upon research. The pattern being followed for decentralisation appears to resemble that adopted in this country by Imperial Chemical Industries Ltd., the formation of 'product-type' groups. Five industrial divisions have been created—Cement-Coke; Chlorinated Products; Chromium Chemicals; Plastics; Silicate, Detergent, and Calcium. All but the Chromium Chemicals section were formed in 1954.

Spreading the Burden

DECENTRALISATION has been introduced to spread the burden of management in a large company whose product and geographical diversity is substantial. Profit-making responsibility has been boldly delegated, and it is already said that this has not only eased the strain upon general management at the centre but also increased the important team spirit among executives. Companies in the US do not operate under the political shadow of nationalisation threats. If decentralisation pays better dividends there, it is because it is more efficient in normal and private competition. In this country, the need for decentralisation to its utmost limits is doubly important in all large companies for the excessive centralisation of nationalised industry is its most demonstrable weakness. If diverse and large-scale private enterprise is similarly organised, however, public opinion cannot be expected to bother unduly about other distinctions between the two methods of running nationally important industries.

Simplicity Pays

EACH of the five divisions, under the name of its own general manager, provides a separate report of activities and progress. If these reports have a somewhat technical background, they nevertheless read easily and avoid stilted phraseology. Although quite a number of British companies have already realised the value of modernising their presentations of annual reports and accounts, there are many more who might profit by studying the Diamond Alkali model. This is especially true of the chemical industry whose operations acquire more and more complexity each year. The first step in a sound public relations policy is to be understood. Arousing interest can be quite as important as paying it.

Vinyl Acetate Output

DOUBLING of the productive capacity of the vinyl acetate unit of the Pampa, Texas, plant of Celanese Corporation of America will be completed about 1 June, R. W. Kix-Miller, general manager of the chemical division of the company, announces. Although the original design provided for increased output, the current expansion is considerably ahead of the anticipated schedule.

'In addition to a potential 80,000,000 lb. consumption in water-based paints by 1957,' Mr. KixMiller says, 'vinyl acetate is utilised for polyvinyl acetate adhesives, coatings for leather, paper and cloth, sheets and films. It is also used as an intermediate in the preparation of pharmaceuticals. The abundant supply of basic raw materals produced by the company's two Texas plants places it in a good position to meet increasing demands.'

Mr. KixMiller said that facilities are now being installed at Pampa for production of methyl ethyl ketone to satisfy demand for this product by manufacturers of surface coatings, lubricating oils, paint removers, adhesives, industrial cleaning compounds, insecticides, artificial leather and photographic film.

'Methyl ethyl ketone operations,' he says, 'will give the chemical division an important addition to its established group of solvents which now includes acetone, alcohols, esters and glycols.'

Big Increase In I.C.I. Sales

Records at Home and Overseas

CONSOLIDATED group sales of Imperial Chemical Industries in 1954 amounted to £352,100,000, a considerable increase over the 1953 figure of £281,900,000. The company's home and export sales were records, both in volume and value.

The annual report, just published, says that the policy of the company of keeping prices as low and stable as possible was pursued throughout the year. A few increases and a few decreases in price were made, but on the average the company absorbed practically the whole of the rise in costs of wages, transport, and raw materials, including fuel.

Sales of Terylene polyester fibre, the main plant for which at Wilton is rapidly working up to full production, continued to increase, and plant for additional capacity is already in hand. New organic products from both Billingham and Wilton are making an increasing contribution to turnover. There was a big demand for plastics, and sales of decorative paints rose to record levels.

Expenditure of the company's construction programme, including replacement of old plants amounted to £34,000,000, making a total expenditure of £190,000,000 on new fixed assets since the end of the war. Attention to productive efficiency has meant that the volume of production in 1954 was approximately double that of 1946, although the total number of employees rose by only 17 per cent.

Accident prevention in the company's factories was given unremitting attention, and the accident rate is now down to one lost-time accident per 100,000 hours worked. This is about one-third of the 1946 level, and the objective is now to achieve a further reduction of 50 per cent.

Increase in Exports

The value of the company's direct exports (£67,500,000) showed an increase of 16 per cent over 1953, compared with an increase of 3 per cent for UK exports as a whole. The rise was spread over many products, but particularly those of the Alkali, Dyestuffs and Plastics Division, which contributed respectively £2,450,000, £2,740,000 and £1,800,000 to the total increase of £9,300,000. The Plastics Division has multiplied its exports almost five times since 1948 and now ranks as a major exporting Division.

There was keen competition in the export field from other major chemical producing countries, notably the US, Germany and Japan. In some countries, particularly in South America, competitors were helped by the currency situation, but where the company was able to compete on equal terms this competition was successfully countered.

Research Work

The need and scope for research and development continue to increase and expenditure on these activities now exceeds £8,000,000 a year.

During the year there was a noticeably increased call in the manufacturing divisions for research directed towards improvements to existing processes not necessarily requiring major new capital expenditure. Schemes for the modification of some of the company's older manufacturing processes, in order to incorporate improvements resulting from recent rapid advances in technology throughout the world, called for more research and development effort, and more attention was also devoted to basic engineering and chemical engineering research, particularly in the fields of instrumentation and automatic control.

At the end of the year company employees in the UK numbered 112,000 (2,500 being employed in HM Government Agency factories), an increase of 4,400 during the year. Very few people were discharged, although I.C.I's oldest factory, at Roslin, Midlothian, had to be closed because of danger of subsidence from coal mining. The factory had made gunpowder since 1790 and the 70 employees were found work in other I.C.I. factories, where possible, or paid gratuities based on length of service.

The recruitment of scientists and engineers of the high calibre needed continues to demand the closest attention. The recruitment of young engineers presents a special problem (says the report) because of the many other industries which offer them attractive careers.

An outstanding development during the

year was the establishment of the company's residential training centre at Warren House, Kingston Hill, Surrey. Staff, commercial, work study and other courses which have been developed within the company during the post-war years are now being brought together in this building and the new facilities will provide opportunities for extension of these activities. About 400 members of the staff will be able to attend the training centre each year.

Profit Sharing

The profit sharing scheme mentioned in the annual report for 1953 has now been introduced and has been welcomed by employees. The scheme covers all employees with the requisite age and service qualifications, apart from directors. It is administered by nine trustees, all employees and some drawn from the works payroll.

In the accounts the provision for depreciation by the group is £16,617,557, against £11,551,012. The increase is partly due to depreciation charged on the accounts of new subsidiaries and depreciation on new plants coming into commission. In addition, the Divisions made during the year a review of the estimated economic working lives of all operating units in the UK.

The fruits of research and continued technological improvements are such that many plants may need to be replaced or modernised in future while still physically capable of production. Accordingly, the estimates of the remaining working lives of many of the producing units, particularly those in the newer and rapidly changing fields of chemistry, have been reduced and the annual provisions for depreciation correspondingly increased.

An appendix to the report reviews the progress made by the company's divisions during the year. Practically all of them tell of increased sales, as the following examples show:

'The volume of sales was 9 per cent above that of 1953 and 2½ per cent above that of the previous highest year, 1951; and the increased sales were well distributed over the principal consuming industries' (Alkali Division).

'The Division's products were in great demand throughout the year and the volume of sales of most products approached the limit of manufacturing capacity in spite of additional new plant which came into operation. The total value of sales to all markets in 1954 was 26 per cent greater than in 1953' (General Chemicals Division).

'Sales for 1954, both at home and overseas, were the highest in the Division's history' (Dyestuffs Division).

'In spite of three major price reductions during the year, the value of sales was 13.5 per cent higher than in the previous record year, 1953' (Pharmaceuticals Division).

'The demand for the Division's products was such that nearly all its factories worked to capacity throughout the year' (Billingham Division).

'By the autumn of 1954 the Division was embarrassed by the volume of demand for some of its products which exceeded its capacity to produce' (Metals Division).

'The demand for the Division's products continued to increase, and sales at home in 1954 were nearly 20 per cent greater in value than the record sales of 1953; overseas sales increased by 30 per cent' (Plastics Division).

Generally, the company's overseas interests had a good year. However, in the US the level of business in the textile industry remained low and the company's manufacturing subsidiary, Arnold, Hoffman and Company, Inc., had another difficult year. Its troubles were aggravated by damage caused by the hurricane 'Carol' which swept the eastern seaboard of the United States, and it was decided that it would be prudent not to declare a dividend for the third and fourth quarters of the year.

It is expected that the multi-products vat dyestuffs plant which cost approximately $4,000,000 and came into production early in the year, will broaden Arnold, Hoffman's range with advantageous results. The benefits from this plant will accrue slowly, and active steps are being taken to improve the present position.

Overseas Markets

In spite of competition, the company's sales to Western Europe increased by 17½ per cent. Sales to Japan fell off considerably owing to the deflationary policy of the Japanese Government, but it was considered that Japan would, in the future, be a market of importance for a range of the newer I.C.I. products. The staff of Imperial Chemical Industries (Japan) was therefore strengthened, and the Kobe office was moved to Osaka, where it will be nearer to the main industrial area.

NINE years after its formation, the British Rayon Research Association saw its permanent premises formally opened by HRH the Duke of Edinburgh on 11 May. The research station, at Heald Green, Wythenshawe, Manchester, has cost £500,000 to build. Already, the work of the association has expanded so greatly that the new building is too small, and a large part of the temporary premises in Barton Dock Road, Manchester, is still in use.

The BRRA was founded in 1946, its first president being Mr. Samuel Courtauld. Its main aim is 'to undertake for the man-made fibres industry the experimental work which can be more cheaply and efficiently carried out on a co-operative basis than by each firm individually.' The particular aims can be summarised as follows:

To contribute to the scientific knowledge on which the future progress of the industry depends. (Since 96 per cent of man-made fibres on the world market are based on cellulose, the association is concentrating on the basic chemistry and physics of cellulose).

To help the industry to enter new markets by attacking the technical difficulties involved. (For instance, there is a great future for fabrics made from blends of man-made fibres both with each other and with natural fibres, and the association is carrying out a comprehensive programme of work on blends.)

To develop new machines, new modifications to machines and new instruments for better processing and process control.

To help member firms in their day-to-day difficulties.

Building difficulties and the shortage of scientists meant that the association's progress to start with was slow. The present director of research, Mr. J. Wilson, M.C., M.Sc., was appointed in 1947 and in 1948 work began on the temporary laboratories. By the spring of 1949 the first 16 members of the staff, which now numbers nearly 300, had begun work.

Building of the present premises began in March, 1951. Although the finishing touches were not completed until the spring of this year, staff have been moving in since the autumn of 1953. The work they are doing is a continuation of what has been in progress for a number of years.

The importance of this work is shown by the fact that UK production of viscose rayon, which was 4,000,000 lb. in 1914, had grown to 198,000,000 lb. in 1950 and 219,600,000 lb. in 1954. In 1953, 80 per cent of UK production was viscose rayon,

17 per cent cellulose acetate and 3 per cent other man-made fibres.

At a Press visit to the research station before its formal opening, Mr. Wilson said that in spite of these figures rayons were still in their infancy and there was no reason why Britain to-day should not do with the help of rayon what she had done before with the help of cotton.

It should be possible, he went on, to reduce still further the price of rayon yarn by eliminating the enormous waste which takes place in the preparation of rayon quality pulp. It should be possible to produce rayons with new and improved properties and to guaranteed standards of launderability, light-fastness and finish and it should also be possible to make more effective use of the enormous range of the new fibres and the new dyes and finishes.

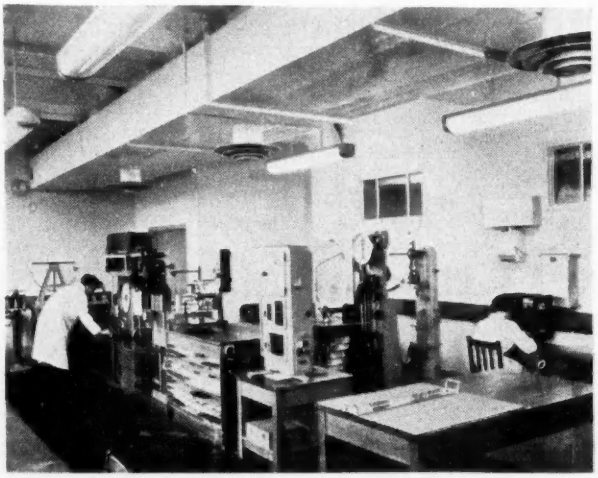
The buildings of the research station occupy half of a 25-acre site. They consist of a main building, which houses the fundamental research laboratories, administration, conference rooms, library and lecture theatre; a technology building; and various ancillary buildings, such as a solvents store, garages, an electrical sub-station, etc.

The association is divided into various departments. These include fundamental research, technological research, machinery development, instrumentation and member service.

The technological group aims to help rayon enter new markets by attacking the technical difficulties involved. At present it is concentrating on the difficulties in the production and processing of blended yarns. The machinery development section exploits the possibilities of new ideas in textile machinery design, and the purpose of the instrumentation section is to develop new instruments for better process control. In particular, this section is trying to introduce modern electronic methods of control into the textile industry.

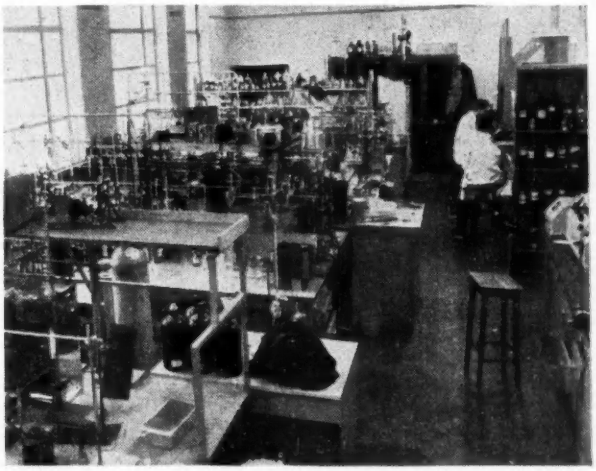
The aim of the fundamental research group is to uncover new facts which might form the basis for future industrial development. On the chemical side, attempts are being made to discover whether the cellulose chains are branched or linear, whether sugars other than glucose are constituents of the cellulose molecule and whether all the links between the constituent sugar residues are 1-4 β glucosidic linkages. A technique involving the acid hydrolysis of heterogeneous systems is being used to obtain more information regarding the physical structure of cellulose.

Study is also being made of the mechanism by which oxygen reacts with carbohydrate molecules under the action of light in the presence of certain types of dyestuffs and other catalysts. This problem has been approached by first investigating the photo-oxidation of simple compounds related in chemical structure to cellulose. A detailed mechanism for primary and secondary alcohols has been put forward and the efficiency of certain anthraquinones as photochemical sensitisers has been explained. These alcohols are suitable models for the purely



Part of the Testing Department

One of the Chemical Laboratories



oxidative changes involved in tendering. The degradative process is related to the photosensitised oxidation of ethers. The relative reactivities of a series of compounds containing alcohol and ether groupings have been measured in order to assess the likelihood of oxidative attack taking place by preference at particular sites in the cellulose chain.

Explanation of why the oxidised cellulose chain breaks down when the fabric is treated with a mild alkali (such as soap) has been achieved by a generalisation which may have a bearing on the problem of the considerable losses of cellulose which occur during its extraction from wood and subsequent refining and has been shown to be applicable very widely in carbohydrate chemistry.

Flash photolysis is being used in conjunction with more conventional photochemical methods in an attempt to discover the fundamental processes occurring in dye fading and phototendering.

The fundamental dyeing section has been concerned with the mechanism of the uptake of dyes by regenerated cellulose acetate. Investigation of dyeing equilibria has led to a better understanding of the affinity of direct dyes for various forms of cellulose and to a measurement of the forces of interaction between disperse dyes and cellulose acetate. These forces have been interpreted in terms of general polar interaction, the contribution of hydrogen bonds being relatively unimportant. Other work has been directed towards a study of the absorption of vapourised dyes by hydroprobic fibres such as cellulose acetate, nylon and Terylene.

The physical structure of the cellulose fibre is being studied by means of a variety of techniques. The fine structure group, for example, is mainly concerned with the arrangement of the molecule within the crystalline and non-crystalline regions of fibres. Visible light is being used to show how the packing of the molecules in the outer regions differs from that in the inner regions of a filament. Strain birefrigence techniques are used to relate the physical properties of the bulk material to the properties of the individual long chain molecules of which it is composed and thus obtain an estimate of the flexibility of the chain. Among other fields being covered are the surface topography of fibres (by means of electron microscopy), the laws governing friction in visco-elastic materials and the mechanism of water absorption by cellulose.

The testing department is largely concerned with the problems of members. It includes a physical testing laboratory, a chemical laboratory, a microscopy section and a cloth examination section.

The chemical laboratory is equipped to carry out analyses of textile materials for composition; identification and estimation of finishing materials; fastness tests on dyed materials; water proofing tests; determination of shrinkage, etc. A standard method of test for shrinkage on washing of woven rayon and synthetic fibre fabrics has been developed.

A Satisfactory Year

Albright and Wilson Report

A NEW company, in which the Bradford Dyers' Association and Albright and Wilson will be equal partners, is being formed to develop and promote processes by which certain textiles may be made fire-retardant. This is mentioned in the annual statement by the chairman of Albright and Wilson, Mr. Kenneth H. Wilson.

The statement says that 1954 was a satisfactory trading year throughout the group of companies. Turnover increased in each of the countries in which the group operates, and three new manufacturing units were completed during the year and are now operating.

New Factories

For the parent company the most important development of the year was the completion of new factories at Portishead and Kirkby. The output of phosphorus from Portishead and of sodium tripolyphosphate from Kirkby gradually increased during the second half of 1954, so that supplies of both products are now ample for present requirements and to cover market forecasts for several years ahead.

Turnover of the English company was about 20 per cent above that for 1953 and most of this increase was due to the output from these new plants.

The development of the Oldbury Electro-Chemical Company's new site at Columbus, Mississippi, US, is proceeding. Sodium chlorate manufacture began there in July 1954, and the output is expected to reach its planned volume during June of this year and to be required, in the main, by the paper industry for bleaching woodpulp. A plant for the manufacture of phosphorus pentasulphide has now been completed at the Columbus site to supply the requirements of the southern and south-western states.

The growth of the Canadian markets for phosphates and chlorates, although not so rapid as was generally predicted several years ago, has supported a satisfactory increase in the turnover of Electric Reduction Co. of Canada. The installation of the new phosphorus plant at Varennes has been completed, and the head office of the company has been transferred from Montreal to Toronto.

The scale of operations of Albright and Wilson (Australia) is now sufficient to warrant a separate sales organisation, and this was established in October. Previously, sales were conducted through I.C.I.A.N.Z.

Rome Symposium

DR. MARGARET WRIGHT of the Walton Oaks Research Station, Dr. R. Braude, Dr. W. M. McKay, and Dr. J. Duckworth of the Rowert Research Institute, Aberdeenshire, were among scientists of 15 nations who attended a symposium in Rome on 12 May sponsored by the Pfizer Agricultural Institute of Terre Haute, Indiana, to discuss antibiotics and growth factors in animal nutrition.

Professor Renzo Giuliani, Director of the Institute of Zootechnics of the University of Florence, said at the opening of the symposium: 'In a few years, antibiotics have become a boon to man. Now they seem destined to become a formidable influence in improving animal nutrition.' Dr. Jasper Kane of the US stated: 'If all the pigs in Europe had their feed supplemented by antibiotics to accelerate their growth, there would be 600,000,000 lb. more pork available now, and more than 1,300,000,000 lb. of pig food would be saved in a year.'

West German Chemical Exports

Chemical supplies exported by the West German Federal Republic in 1954 totalled DM.2,980,000. European countries imported 61.2 per cent, against 59.5 per cent in 1953. Exports outside Europe dropped from 40.5 per cent to 38.8 per cent as the result of decreased sales to North and South America. The US had been West Germany's biggest buyer of chemicals, but in 1954 purchased almost one-third less than in previous years.

US Plastic Metal

A new putty-like material consisting of 80 per cent steel and 20 per cent plastic has been developed by the Chemical Development Corp., Danvers, Mass. Called Devcon, it is packed in a metal container, and can be used for rebuilding machinery, filling holes in castings, and making moulds, dies and models.

It can also be used domestically for repairing cracked or leaky radiators, as well as low-pressure steam boilers.

Freedom For Plant Manufacturers

Capacity, Deliveries and Exports Increase

THE annual report for 1954 of the British Chemical Plant Manufacturers' Association says that the year saw the chemical plant industry working under conditions of freedom from controls which it had not enjoyed since 1939. A number of expansion schemes were completed or further developed which greatly increased the productive capacity of the industry. As a result members were able to quote much improved deliveries and to meet with confidence the demands which their customers, in particular the home chemical and allied industries, continued to make on them.

Although few serious difficulties were reported by members, raw material supplies during the year were still not as satisfactory as the industry would have liked. Steel plate, in particular, caused trouble and by the end of the year there were signs of steel deliveries lengthening again.

The joint committee of the ABCM and BCPMA which is investigating the need for, and possibilities of, a greater measure of standardisation and simplification of chemical plant and equipment, made considerable progress during the year.

Standardisation Sought

On the recommendation of the committee, the Association asked the British Standards Institution to prepare a standard for sight and light glasses based on a range of recommended sizes and a code for the vacuum testing of vessels to cover recommended ranges of vacuum. It also asked the Institution to revise and extend the standard flange tables in the lower ranges of pressure.

A problem to which considerable attention was devoted was that of the lengths over flanges of chemical valves; the data collected was still under examination at the end of the year.

Other matters receiving the attention of the committee at the end of the year were the possible need for standards for dust-proof electrical gear and the standardisation of manholes and covers. The latter was considered in co-operation with the BSI committee studying the subject; on the Association's recommendation the committee's work on manholes has been extended to cover hand holes.

In view of the similarity of much chemical plant and petroleum equipment the association, on the recommendation of the joint committee, asked the BSI that the work of the various chemical engineering and petroleum engineering committees should be properly co-ordinated to avoid duplication. The need for such co-ordination was accepted by the Chemical Engineering Industry Standards Committee of the BSI and the question is to be reviewed by the Institution.

During the year BSI committees on which the Association is represented issued draft standards for acid-resisting bricks and tiles, for jacketed pans for the food and allied industries and for sizes of trade and technical literature.

Education Survey

Following a study of the OEEC report on 'Chemical Engineering in the USA,' parts of which indicated that facilities in the United Kingdom for chemical engineering education were not fully appreciated, the Institution of Chemical Engineers was asked by the BCPMA and the ABCM to carry out a comprehensive survey of such facilities in Great Britain. The Institution prepared an excellent survey which showed that, while good use was being made of the training facilities for university degrees, postgraduate diplomas and the Institution's own examination, poor use was being made of the courses for the Higher National Certificate in chemical engineering.

That the chemical plant industry has not taken more advantage of the HNC courses continues to be a source of disappointment to the executive committee (says the report), and it again urges members to encourage their young men to take such courses.

The Association has been collecting from members data regarding the number of chemical engineers employed by them and their likely future demand for them. Though some replies were still awaited at the end of the year, the figures so far obtained indicate a considerable and growing demand from chemical plant manufacturers.

The Association last year made representations to the committee appointed by the President of the Board of Trade to review the question of duty-free imports of machinery; facilities for remission of duty had been suspended since March 1952.

The committee's report, published in July, recommended that arrangements for duty-free entry of machinery be resumed, though not on the wide and general scale that had obtained in the past, and that they should be extended to cover plant as well as machinery. The committee's views on the criteria by which applications for remission of duty should be judged followed closely those put forward by the BCPMA in its memorandum of evidence.

Problems of Definition

Facilities for duty-free entry of machinery were resumed in August. However, the extension of facilities to plant would involve legislation and the Government announced that before taking a decision it would ask for further examination of the committee's recommendation on this point by a consultative committee. By the end of the year the appointment of this committee had not been announced. The executive committee of the BCPMA feels that if provision were made for duty-free entry of plant it would have serious implications for members and that, owing to the very real problems of definition that would arise, it would be difficult to give adequate protection to the interests of UK manufacturers.

The demand from overseas for capital equipment continued buoyant throughout the year and chemical plant exports were higher than in 1953. The increase was achieved in spite of greater competition. It was also gratifying to find evidence that the industry had recovered much of the goodwill lost in recent years through late deliveries caused by factors beyond its control. Total value of exports by chemical plant and allied manufacturers in 1954 was £9,570,000, compared with £9,150,000 in 1953 and £7,460,000 in 1952.

A disturbing feature of the year, says the report, was the number of new projects for trade fairs mooted in all parts of the world. Firms were under constant pressure to exhibit at these fairs, many of them of dubious value. Another undesirable development was the increase in the number of fairs organised on a national pavilion basis. This important question has been receiving the attention of the Federation of British Industries, and the Director served on a Federation committee concerned with making recommendations as to the markets in which British trade shows could usefully be staged.

At the end of 1953 the executive committee was considering plans for a regular chemical plant exhibition in the UK. Early in 1954 it became clear from views exprssed by members that such an exhibition would be very well supported. It was then learned that the Council of British Manufacturers of Petroleum Equipment, with whom the Association has many members in common, was considering staging an exhibition of petroleum equipment. The BCPMA next suggested that there was scope for a combined exhibition of chemical plant and petroleum equipment which would be of much greater benefit to members than any exhibition which each association might hold separately.

This suggestion was enthusiastically received by the executive committee of both bodies. The joint committee appointed to plan the exhibition found it was not possible to book a suitable hall in 1956 or 1957, the years originally envisaged, at a time which did not clash with other important engineering exhibitions. Accommodation was, however, available in 1958 in May or June, the precise dates depending on the programme for the British Industries Fair that year, which will not be settled until early in 1956. The Chemical and Petroleum Engineering Exhibition, therefore, will be held at Olympia (Grand Hall) for ten days in May or June, 1958.

During the year the membership of the Association rose from 199 to 209 (171 full members and 38 associates). In the past six years the Association has more than doubled in size, a growth, says the report, which reflects the firm establishment in the United Kingdom of chemical engineering as the fourth primary technology.

Scots Conduct Fluorine Tests

Tests for the effects of fluorine on teeth began in Kilmarnock, Scotland, on Tuesday, where two surgeons from Edinburgh University are acting as recorders. During the next three weeks 1,500 school children up to 16 years of age, and 250 between three and four, will be examined and the condition of their teeth noted.

Titrations in Anhydrous Solvents

Part I—Theoretical Survey

by T. S. WEST, B.Sc., Ph.D., A.R.I.C.

TITRIMETRIC methods of analysis are almost invariably performed in an aqueous medium, not only because water happens to be a very readily available and cheap solvent, but principally because titrimetric methods of analysis are directed mainly towards the determination of substances which are electrolytes. This fact makes water the ideal medium for carrying out the experimental part of the investigation. Not only are electrolytes very soluble in water, but they are almost always highly dissociated or ionised because of the high dielectric constant of the medium. This dissociation process has always been considered an essential preliminary to most titrimetric procedures.

Recently, however, there has been a shift of interest away from strong electrolytes to the determination by titrimetric methods of those substances which can be considered only as weak electrolytes or non-electrolytes. The determination of a weak acid by titration even with a strong base in aqueous solution is a well-known problem. It must be realised now, however, that the fault in the titrimetric method is not due to the so-called 'weak' nature of the acid, but is due to the selection of water as the titration medium. As will be shown subsequently, water is a most unsuitable medium for this type of work. By selecting any of several different solvents belonging to a certain type, it is possible to obtain end points equally as sharp as those observed in strong acid-strong base titrations.

Industrial Possibilities

It is well worth while to note that the main driving force behind the recent interest in titrations in anhydrous solvents has come from industrial requirements rather than from academic studies in this most interesting field of research. Industry is constantly seeking rapid, accurate methods for process control. The rapid spread of continuous process production requiring swift, precise analyses at various stages has led, of course, to the use of continuous reading and recording instruments, but these instruments cannot always be applied and in many cases the answers they give are insufficient or not accurate enough. The evolution of modern separation methods based on techniques such as ion exchange, chromatography, fractional distillation or partition has now made possible rapid and clean separation of chemically similar substances so that by use of a sensitive determination method in conjunction with these, it is possible, for example, to separate the various members of a mixture of aliphatic acids and estimate these by titrimetric methods.

Titration methods in anhydrous solvents have been shown to be reliable, highly accurate and rapid, and even though the principles of the method are not always known with any degree of certainty, they are nevertheless available for a whole range of analyses.

Historical Background

In 1902 L. Kahlenberg reported that certain reactions closely resembling those between ions in aqueous solution could be observed in benzene (*1*). According to the electrolytic theory of dissociation, ionisation cannot take place in such a solvent, of course, but in the following year a titrimetric method for the determination of aniline using hydrochloric acid in benzene was reported. Vorlander (*2*), who carried out this work, was mainly concerned with the colour change of the dyestuff known as methyl yellow when it was treated with excess of hydrogen chloride in a solution of benzene containing aniline. The analytical significance of his experiments appears to have eluded him. Seven years later, the first truly analytical experiments were reported by Folin and Wentworth (*3*). These workers evolved titrimetric methods for various higher aliphatic acids in benzene, toluene, chloroform and carbon tetrachloride using a solution of sodium ethylate as titrant. Sharp end points were obtained using various indicators. In 1912 Folin and Flanders (*4*) titrated hippuric acid, extracted from urine, in chloroform, by a similar

method. In 1923 the Bronsted theory of acids and bases appeared (*5*). It is not proposed to discuss the Bronsted theory here, but briefly it stated that an acid was to be regarded as a substance capable of furnishing protons whilst a base was to be regarded as a substance capable of accepting protons.

$$\text{Acid} \rightleftharpoons \text{Proton} + \text{Conjugate Base}$$

From the point of view of titrations in anhydrous solvents, this new theory means that substances such as the cationic pyridinium ion ($C_5H_5NH^+$), the anionic bicarbonate ion (HCO_3^-) as well as neutrals such as HCl, HNO_3, etc., are to be regarded as acids whilst bases can also be neutral (NaOH) cationic ($Al(OH)_2^+$) or anionic ($OC_2H_5^-$), etc. Another important feature of the theory is that a substance cannot act as an acid unless there is a basic substance present to accept the protons which the acid tends to donate. Thus a neutral acid will not be ionised unless the solvent in which it is dissolved has a sufficiently basic nature to accept its protons. Picric acid forms a colourless benzene solution of low conductivity. This is evidence for non-ionisation of the acid. When aniline is added to the benzene, however, the typical yellow colour appears and the solution conducts electricity. This is interpreted as evidence for the influence of the nature of the solvent on the acidity of the solute.

Selection of the Proper Solvent

In this type of work, the selection of an appropriate solvent for carrying out the reaction is even more important than selecting the best titrant. Consideration must, therefore, be given to this most important aspect of the subject right at the start.

Solvents may be classified into two main types.

1. Those which ionise.
2. Those which are non-ionisable.

The first category includes solvents such as water, alcohols, acetic acid, sulphur dioxide, etc. Both acids and bases react with this type of solvent

$$HX + EtOH \rightleftharpoons X^- + EtOH_2^+$$
$$B + EtOH \rightleftharpoons HB^+ + OEt^-$$

The action of the acid or base on the solvent leads to the production of solvent cations or anions. The tendency for the solvent to accept or donate protons, as required by the solute, will influence the basic or acidic nature of the latter to a marked extent.

In the second category the solvent does not ionise, but it may or may not react with the solute to form an addition compound or complex. Fritz (*6*) actually classifies solvents into three categories because of this difference. His third category being 'Inert' solvents. Reactive non-ionisable solvents are those such as ether, dioxan and pyridine and these generally combine with acid or base, but not with both. Inert non-ionisable solvents are those such as benzene, toluene, carbon tetrachloride, etc.

As indicated previously, the fact that a solvent is non-ionisable or non-reactive does not mean that it is useless for titrimetric purposes, for dissociation of the acid or base is not essential for titration to be effective. Indeed in this type of titration, ionisation is sometimes most undesirable. Thus carboxylic acids which are non-ionised in benzene can readily be titrated with sodium methoxide to a sharp end point, but the addition of alcohol to increase the ionisation of the acid decreases the sharpness of the end point (*7*).

The main requirements of a solvent for use in acid-base titrations in non-aqueous media have been outlined by Fritz (*8*). These are as follows:—

1. The solvent must dissolve the substance to be titrated.
2. The products of reaction should be soluble or come out as crystalline precipitates. (Absorptive, gelatinous precipitates generally cause low results with indistinct end points.)
3. The solvent should be available commercially in a highly pure state.
4. There should be no disturbing side reactions of the solvent with the titrant or the solute being titrated.
5. Titrations of very weak bases (or acids) should be possible.
6. The cost and availability of the solvent should be reasonable.

In selecting a solvent for the titration of a weak acid it is important that the acidity of the medium should be negligible, because the solvent is present in overwhelming excess. Thus the acid nature of water is sufficient to upset the sharpness of the end point. Obviously, for such a titration a solvent such as butylamine will enhance the tendency for the acid to donate protons and hence favour the production of a sharp end point. Of

course, the solvent must not be sufficiently basic to prevent the titration of the acid with a reasonably strong base, but in this connection it may be observed that there is no need to use anything but a strong alkali for the titration. In solvents possessed of some basic characteristics the acid species which is active

$$HX + H_2O \rightleftharpoons H_3O^+ + X^-$$
$$HX + QH \rightleftharpoons QH_2^+ + X^-$$

is always the solvated proton. In aqueous solution, most mineral acids are 'neutralised' to almost the same extent by the solvent to produce the same amount of hydroxonium ion. Thus acids such as perchloric and hydrochloric acid have approximately the same strength. Acetic acid on the other hand is only 'neutralised' to the extent of about 2 per cent. If butylamine is used as the solvent on the other hand, acetic acid is 'neutralised' almost to the same extent as hydrochloric acid and both are equally powerful as titrants for bases in such a solvent. Hantzsch (*9*) has referred to this important feature as the Levelling Effect. Thus butylamine has a levelling effect for acetic acid and hydrochloric acid, water has a similar effect for perchloric acid and hydrochloric acid, whilst sulphuric acid levels practically all bases. Acetic acid has a levelling effect which is intermediate and phenol an effect just greater than water. The use of an acidic solvent for acids or a basic solvent for bases has a non-levelling effect. Thus in glacial acetic acid perchloric acid is revealed to be considerably stronger than hydrochloric acid or any of the other common mineral acids. If a mixture of acids or of bases is to be titrated, selectivity can obviously best be achieved by use of a non-levelling solvent, and total titre by use of a strong levelling medium.

Information on the strengths of acids and bases in various anhydrous solvents is difficult to find. Riddick (*10*) observes that it is probable that the strength will have to be determined for each acid and each base for each amphiprotic solvent used. Izmailov (*11*) concluded that the relative acidity of two acids varied from solvent to solvent and that the variation of the ratio of their acidities would be greater the more different were the acids. In studying formic acid as a titration medium, Shkodin, Izmailov and Dzyuba (*12*), (*13*) found that practically all bases were levelled. Inorganic acids remained strong and were not differentiated as in acetic acid. Carboxylic acids such as acetic, monochloroacetic, trichloroacetic, salicylic acid, etc., are so weak in formic acid, that they cannot be titrated.

Ethanol dissolves many organic bases which are insoluble in water and it has therefore been employed as a solvent. It has generally been found, however, that the basic strength of the alcohol is too great to allow successful titrations to be effected. Carboxylic acids having pK (water) values $\leqslant 6$ may be titrated successfully in this medium with an alkoxide titrant in the same solvent, but the sharpness of the end point is improved by using an inert non-ionisable solvent as the titration medium.

Glacial acetic acid has been used successfully by many workers for the titration of many amine bases. Even the weak aromatic bases give distinct end points particularly when perchloric acid in the same solvent is used as the titrant. The sharpness of the end point is, however, disturbed by the presence of water and the addition of acetic anhydride for its removal is generally advocated. Usually an excess of acetic anhydride may be used, but this must be avoided when dealing with primary and secondary amines. Acetic acid has found little application in dealing with the analysis of acids. The use of formic acid has already been mentioned. It is, however, an unpleasant medium to handle and is difficult to maintain in a sufficiently anhydrous condition.

Inert Solvents

Various inert solvents such as benzene have been used for the titration of bases. Formerly (*14*) hydrochloric acid in benzene was used as the titrant, but difficulty was experienced due to inability of the solvent to retain the hydrogen chloride. Replacement of the latter by *p*-toluenesulphonic acid (*15*) did not lead to much improvement because of the weaker nature of the acid. More recently, however, it has been shown that a much more satisfactory answer to the problem lies in using a titrant consisting of perchloric acid in glacial acetic acid. Benzene, chlorobenzene, nitrobenzene, chloroform, ether, ethyl acetate have all been used as solvents in conjunction with this titrant and sharper end points have been observed than in acetic acid alone.

Considerable evidence exists to prove that the use of a mixed solvent is very frequently

superior to the use of a single solvent. For example, Pifer and Wollish (*17*) found that much sharper end points were obtained in titrating various bases in acetic acid with perchloric acid in the same solvent when dioxan was present. In some instances where no end point could be observed in acetic acid, sharp breaks in the potentiometric curve were obtained when concentrations of dioxan varying from 30-85 per cent were present. The increased sensitivity was most marked with dilute perchloric acid titrants. Similarly (*18*) it was shown that the addition of solvents of low dielectric constant sharpened the end point of many titrations in glacial acetic acid. Generally the presence of water as the second solvent has an adverse effect on titrations in organic solvents, but Thiers (*19*), studying the titration of many acidic and basic substances in 95 per cent alcohol with sodium hydroxide or hydrochloric acid, concluded that water added during titration flattened out the buffer region of the curve thus sharpening the end point.

A GH Solvent System

Palit (*20*) introduced a GH solvent system. 'G' denotes ethylene glycol and 'H' a hydrocarbon solvent such as isopropyl alcohol. This type of solvent may be used for many titrations. Acids having ionisation constants not greater than 10^{-4} can be titrated with sharp end points whilst bases as weak as aniline may also be titrated with a solution of hydrochloric acid or perchloric acid in the same mixed solvent.

An indicator for acid-base titrations has been defined by Kolthoff (*21*) as a substance which is a weak base or weak acid, the acid form of which has a different colour from the basic form. There is a considerable range of indicators available for acid-base titrations in water and the mechanism of their reactions is well understood. Unfortunately this is not the case for titrations in other solvents, and there is therefore considerable scope for investigation in this field. The position is further complicated by the fact that there is no absolute measure of acidity or basicity in anhydrous solvents, since the relative order of the strengths of various acids or bases alters from solvent to solvent. The first step in any systematic investigation of this field must obviously deal with specific solvents. In 1927 Conant and Hall (*22*) studied the behaviour of a series of ten indicators of two different structural types, in an acetic acid medium. Kolthoff and Gauss (*23*) investigated the behaviour of several acid-base indicators in ethanol and methanol and found that the ionisation constants were very nearly the same in each medium. Factors affecting the choice of acid-base indicators for titration in anhydrous solvents have been discussed by various authors (*24*), (*25*). Grunwald (*25*) discusses the approach to the choice of acid-base indicators for use in hydroxylic solvents, defining a solvent-sensitivity index Ω such that the δ log K values for acids of different charge types are approximately proportional to the corresponding Ω values, no matter what change in medium is contemplated. The development of this approach is noteworthy and will probably lead to the evolution of a range of suitable indicators.

The marked change in fluorescence of certain sulphonamide derivatives in acetic acid at the equivalence point of acid-base titrations was observed by Tomicek (*26*). De Ment (*27*) listed 63 fluorescence indicators changing colour over each unit of *p*H from 0-14. These indicators were used in aqueous titrations, of course, but Riddick (*28*) comments that many of them should probably find application in other solvent media.

Nadeau and Branchen (*29*) used crystal violet, *a*-naphtholbenzein and benzoylauramine as indicators for the titration of basic substances in glacial acetic acid. Crystal violet and also methyl violet have been widely applied for this purpose by many workers, but experience shows that the colour change at the end point is too complex to be satisfactory. The sequence is from violet (basic) through shades of blue and green to yellow. Seaman and Allen (*30*) selected the correct end point shade of the indicator by a control potentiometric titration, but the procedure is then obviously inferior to the instrumental method itself. Fritz (*6*) has recommended methyl red and methyl orange (screened with Xylene Cyanole) for acid-base titrations in dioxan. These indicators have also been used with Polit's GH solvent.

Acid-Base Indicators

In benzene, chloroform, etc., and in alcoholic solvents, conventional acid-base indicators such as phenolphthalein, thymolphthalein, thymol blue and azo violet have found considerable scope. Thymol blue is particularly valuable for titrations in ben-

zene, butylamine, dimethylformamide, pyridine, etc., since the blue to yellow end point is unusually sharp. The colour change is unsatisfactory in ethylenediamine, however, but azo violet is more satisfactory in this solvent, particularly for the titration of acids too weak to give sharp thymol-blue end points. Weaker acids such as phenol, which cannot be titrated using thymol blue or the weaker acid azo violet, may be titrated readily using *o*-nitroaniline. The colour change with this indicator is not particularly good, but it is observed best in dimethylformamide or ethylenediamine. No end point can be seen in benzene, ethanol or butylamine.

The ideal indicator should, of course, change colour at the equivalence point irrespective of the ionic strength of the solution or of the concentration of neutral solutes. Grunwald (*loc. cit.*) quotes the example of the titration of benzenesulphonic acid with sodium acetate in glacial acetic acid using crystal violet. The correct end point colour varies greatly with the concentration within the range 0.02M-0.001M. Fortunately, bromophenol blue functions free from this variation within the concentration range cited.

Differential titrations of various amines in acetonitrile have been carried out using eosin Y and methyl violet. BZL-Blau (Ciba 22062) has been used for the titration of strong bases in glacial acetic acid and neutral red and Nile blue for weak bases in acetic acid (*31*).

Chlorides and bromides may be titrated with mercuric acetate in a glacial acetic acid medium. Detection of the end point was accomplished by the use of dithizone and sodium nitroprusside according to Tomicek and Zukriegelova (*32*). The chloride and bromide were present in these experiments as lithium salts. When lead acetate was used as the titrant, safranine, neutral red or thionine were found to be satisfactory. Thallium acetate could also be used as titrant in conjunction with the last two indicators.

(To be continued)

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Meeting of SLTC

SPEAKING at a meeting of the Northampton group of the Society of Leather Trades' Chemists at the College of Technology, Northampton, on Friday, 6 May, Dr. J. P. Danby gave 'Some Reflections on Education in the Leather Industry.'

While emphasising that all aspects of leather manufacture and its related sciences were covered by full or part-time courses, he said that too few boys were entering the technical side of the industry from school. He suggested that this should be overcome by co-operative action on the part of the trade, the teaching organisations, and school science and careers masters.

Dealing with the requirements of the industry for men trained at different levels—scientist, technologist and technician—he stressed that recruits into the industry should attend courses best designed for their own particular aptitudes. He pleaded for greater co-operation between teachers and tanners, which would be of benefit to both the colleges and the industry.

In conclusion, Dr. Danby turned his attention to the place of liberal studies in a technical education. Teachers had a moral responsibility to assist those under them to develop a range of extra-curricula interests and activities.

Building Research

Chemistry of Cement & Silicates

CONCRETES and cements made from recent batches of Thames river gravel have been found to develop disfiguring brown stains. This has been shown to be due to the formation of ferric hydroxide produced by reaction between the cement and a reactive form of pyrites found in the gravel. The staining is sometimes accompanied by blistering of the surface of the concrete.

Examination of this brown stain shows the presence of ferric hydroxide and etringite (calcium sulphoaluminate — $3CaO.Al_2O_3.4CaSO_4.31H_2O$). The formation of etringite is accompanied by expansion and this may cause blistering of the surface of the concrete.

A report on the investigation of this problem is contained in 'Building Research 1954' published for DSIR by the Stationery Office, price 4s. An account is also given of work that has been carried out on cement and silicate chemistry.

Work on Oxide Mixtures

When studying complicated materials such as cement and blast furnace slag, it has been found effective to work with simpler oxide mixtures, omitting some of the minor constituents, and to deduce from the results so obtained what the behaviour of the actual, more complicated material would be.

An investigation of the system $CaO\text{-}MgO\text{-}Al_2O_3\text{-}SiO_2$ is being carried out. Data for the revision of the system $CaO\text{-}Al_2O_3$ are not yet complete but studies of the system anorthite-spinel have been concluded and the results are awaiting publication. The thermal relationships between the different polymorphic forms of anorthite have also been studied.

The heated stage microscope has been further developed and it is now possible to observe directly the behaviour of silicate melts at temperatures up to 1,800° C. This instrument can be used for the isolation and growth of single crystals from silicate melts for X-ray diffraction studies.

High-alumina cement used in the electrical industry has been found to lose strength if kept in a humid atmosphere at temperatures somewhat above normal. The initial strength of the cement has been found to be due to the formation of $CaO.Al_2O_3.10H_2O$, which is not stable in warm, moist conditions and undergoes a chemical change: $3(CaO.Al_2O_3.10H_2O) \rightarrow 3CaO.Al_2O_3.6H_2O + 2(Al_2O_3.3H_2O) + 18H_2O$. This is accompanied by a decrease in strength. Attempts to stabilise the initial compound by chemical means have so far failed.

Work is being pursued on the setting and hardening of Portland cement. As a first step in a more detailed investigation, metastable equilibria in the ternary system lime-alumina-water are being re-examined first at 25° C.

Hydrodesulphuriser

THE first of its kind to be built in the world, and costing £1,000,000 to erect, the 'hydrodesulphuriser,' a plant which removes sulphur from petroleum products by the 'trickle' technique, has recently come into operation at Shell's Stanlow oil refinery in Cheshire.

Developed by the Royal Dutch/Shell Group's research organisation at Amsterdam, the new plant will increase the supply of high quality fuels for diesel engines and farm tractors and will also make a certain amount of a 100-octane motor spirit component. The 'trickle' technique is so-called because the oil to be desulphurised is contacted with hydrogen and made to trickle over a special catalyst. The hydrogen converts the sulphur into hydrogen sulphide which is separated from the oil and is then itself converted to pure elementary sulphur.

Begun about the middle of 1953 and almost entirely of British manufacture and materials, the 'hydrodesulphuriser' adds further to the reputation of Stanlow as one of the most fully integrated oil refineries outside the United States.

APV Form New Canadian Co.

THE APV Co. Ltd. announce they have formed a new Canadian company, APV (Canada) Equipment, to take over Walker-Wallace Ltd., Toronto, who have been their Canadian agents since 1929. All the shares are held by the British company. It is intended to extend the new company to cover the sale of equipment to all other industries served by the parent company, namely the brewery, food, chemical and related industries, in addition to maintaining existing manufacturing facilities in Toronto.

Too Many Trade Barriers

Chemical Merchants' Annual Report

ALTHOUGH last year witnessed a marked expansion in trade, there were still too many restrictions on the free flow of goods, says the annual report of the British Chemical and Dyestuffs Traders' Association, presented at the 32nd annual general meeting on 17 May.

The chairman, Brigadier C. Norton Stafford, C.B.E., T.D., presenting the report, referred to the useful work performed during the past 12 months and observed that during its 32 years of existence the Association had played an important part in bringing chemical merchants together and facilitating the interchange of experience and views. Reference was also made to the good relationship which the Association had always maintained with Government departments. The report continued (in part):

The period under review witnessed a marked expansion in trade, and the movement of all forms of chemicals to the home-consuming industries was, in the aggregate, probably greater than for any previous year. The export of chemicals through merchants also expanded, and a valuable entrepot trade, in which merchants excelled in pre-war years, is being re-developed. The flow of new products for industry, and the discovery of new uses for existing products owe much to the enterprise of the chemical merchant, and that same enterprise could be used to greater effect if restrictive marketing arrangements were relaxed and the products of the British chemical industry made more freely available, on reasonable terms, to the British merchant.

Tariff Barriers

World trade continues to be impeded by currency regulations, quantitative restrictions and tariff barriers, and these barriers are sustained by the desire of great industries to seek protection against foreign competition, a policy which must progressively reduce the movement of goods between countries. In this connection the renewal of the General Agreement of Tariffs and Trade is welcomed by our Association in that it sets a limit upon rising tariffs for a further period.

The Association continues to press for the Key Industry Duty to be modified and brought within the framework of the Import Duties Act. Reference was made to this question in our last annual report and more recently it has been necessary to draw attention to the practical difficulties that arise for both users and importers under the present system for granting exemption from Key Industry Duty. An opportunity to bring about the change which our Association advocates should be provided by the introduction, in due course, of the new Customs Tariff nomenclature.

Consultative Body

The Association is one of the bodies consulted by the Board of Trade in the preparation of the nomenclature for the common classification of chemicals under the Brussels Agreement. The intention is the facilitation of international trade, in that each article of commerce will fall under the same numbered heading of the tariffs of all countries which adopt the scheme.

The negotiations conducted from time to time by the Board of Trade with other countries for wider trade and payments arrangements have been notified in advance to members, and their comments invited for submission to the United Kingdom representatives. Our Association has also drawn attention to the need for removing unnecessary official regulations which hinder the development of trade as, for example, where the foreign official procedure requires that payment for British exports be effected by a letter of guarantee.

The London dock strike caused many cargoes destined for London to be diverted, and this created a number of problems for merchants. At the outset our Association sought and received the assurance of HM Customs that, subject to certain conditions, the additional charges incurred by importers for bringing goods to United Kingdom ports would not be assessed for duty purposes.

However, the more important question of liability for the additional charges was governed by the Carriage of Goods by Sea Act, and the terms of the bill of lading protected the shipowners from liability.

It will be recalled that a legal opinion on the various questions arising was sent to members. Since that time there has been a movement to set up a central organisation for shippers to consider all matters of policy on, and any major developments in, the relationship between shippers and shipping interests.

In recent years there has been a greater tendency for Associations to co-operate in dealing with their common problems. This does ensure that important general questions are approached with a large measure of agreement in the trades concerned.

Reports have appeared in the Press of a movement on the Continent to form a Federation of European Chemical Merchants organisations. Our Association was represented, without commitment, at an exploratory conference held in Bad Godesberg, and consideration has since been given to the various questions with which the proposed body would be concerned. Your Council is of opinion that the interests of the British chemical merchants would not require our Association to take an active part in the movement as it is at present envisaged. Nevertheless, we shall follow developments and be prepared to re-open the matter should circumstances justify such a course.

Ten Years of Flexibox

THIS year Flexibox Ltd. of Manchester celebrate the tenth anniversay of the formation of the company. During these first ten years Flexibox has become one of the leading producers of mechanical seals for rotary shafts. Flexibox is now a world-organisation with associated companies in the US, France and Germany.

This progress has been possible because of the extremely adaptable design of the Flexibox mechanical seal. Although originally designed for oil refinery process pumps it is now used to eliminate leakage from rotary shaft equipment in many other fields.

Flexibox have also entered a fresh field. They have introduced a lapping machine of new design. It gives extremely accurate results (lapping to within one light-band), gives a high capacity performance (21 in. diameter plate) and is considerably cheaper than other comparable machines.

Factory floor area was doubled last year, and future extensions are being planned.

Monsanto at Copenhagen

MONSANTO Chemicals Ltd. will occupy Stand No. C72 at the British Trade Fair in Copenhagen from 29 September to 16 October.

In the general chemicals section will be many of Monsanto's pharmaceuticals and fine chemicals and there will be a section devoted to resins and plastics. This will include such products as phthalic anhydride, maleic anhydride and styrene monomer, raw materials for the plastics industry, and also a range of plasticisers for synthetic resins.

The Aroclors and Pyroclor, capacitor impregnants and transformer cooling fluids, will be featured as will diphenyl, a preservative for citrus fruits, and Lustrex X.820, a stabilising colloid of particular interest to the paint industry.

Several of Monsanto's rubber chemicals will be on show, notably the pelleted accelerators Santocure, Thiotax and Thiurad. Also in this section will be antioxidants, styrene/butadiene copolymers and Santocure MOR.

Textile chemicals and preservatives will be displayed and there will also be exhibits dealing with Monsanto's oil additives.

Cominco Expansion

THE Consolidated Mining and Smelting Company's new fertiliser plant at Calgary is now operating. When Cominco announced its expansion programme last year, it reported that fertiliser production would be increased by about 50,000 tons per year. After the first few weeks' operation, the new plant, which is largely added ammonia capacity, will permit a production rate in excess of that forecast. The extra capacity, planned to supply the growing demand for anhydrous ammonia in the Pacific north-western section of the US, will also permit an increase in the company's output of solid fertilisers.

With ammonia plants at Trail and Calgary, Cominco is now the largest producer of this agricultural chemical in Canada and the north-west of North America. It also ranks as the largest producer of solid fertilisers in the west. The company's total capacity is now about 800,000 tons of high analysis fertilisers per year.

Oil Equipment in Europe

OEEC Mission's Report Published

REPORTING on the European Oil Equipment industry, the Intra-European Mission (No. 121) organised by OEEC reveals there are practically no factories which specialise in equipment for the oil industry. The findings of the mission, 'Oil Equipment in Europe,' published by the Organisation for European Economic Co-operation in Paris, is obtainable here through HM Stationery Office, price 8s. 6d.

The report points out that while the US is still far ahead in matters relating to the oil industry, Europe has made considerable efforts to make up the leeway and that most, if not all, the works visited by the mission were either newly equipped, were completing re-equipment schemes or were starting to re-equip on a large scale. The mission emphasises that today Europe is perfectly fitted, equipped, and possessing the technique to produce any or all of the pressure vessels required to fit up refineries in accordance with API and ASME regulations.

The report, which can be regarded as a supplement to the findings of Technical Mission (No. 57) on the US industry, and published by OEEC in 1953, is chapter-linked where possible so as to facilitate comparison between given types of equipment in the US and Europe.

The lead the US had over Europe in the oil industry was further increased by the Second World War, when European research was reduced to a minimum, although the report reveals that many large European refineries are affiliated to US companies, or are subject to strong US influence. The result of this is that European companies who do not do their own engineering prefer to apply to US firms, so that European engineer consultant firms experience difficulty in developing.

Great Capital Outlay Needed

Nevertheless, the mission found that apart from specific cases, like catalytic cracking, where American experience is unquestionably needed, there are many instances in which processes are sufficiently well known and no patents involved, which European engineers are capable of dealing with without the aid of US technicians.

It also found that in a number of small refineries more or less independent of the big oil companies the engineering and, sometimes the process design phases, are in the hands of Europeans, but it will be a considerable time before consultant engineer firms in Europe will be able to engage in this section of the oil industry. This involves great capital outlay for large-scale research laboratories, appropriate pilot plant, and long-term training of engineers and chemists specialising in the thermophysical chemistry of petroleum.

Europe Can Supply Own Needs

The mission considers that the difficulty facing the European oil industry is no longer one of insufficient quality or quantity, of production or technical skill, but rather of finding regular outlets. It stresses as being evident, that in Europe, a boiler-making firm could not rely on a single type of customer such as the oil industry, but must seek other outlets. Conversely, a firm specialising in some other sector should be able to rely on supplying the oil industry to maintain a steady output, and that even a firm exclusively working for the industry is obliged to disperse its efforts over a wide range.

Summing up its findings on equipment the mission considers that Europe is capable of supplying its own needs for prime movers, pumps and compressors, and that tube manufacturers are increasingly able to supply the oil industry's requirements, particularly short API tubes from 2 to 10 in., the essential part of the range. European refineries constructed in recent years, wells which have been drilled and pipe-lines laid both in Europe and Africa, have all been supplied with European pipes.

As regards drilling equipment, the mission reports the European product is inferior to US equipment only in limited cases, although consumers still show preference for that made in the US. It recommends that conditions under which European drilling equipment is manufactured would be improved if makers had a closer technical link and, like American makers, co-operated with

technical details. The mission suggests a European Association of Manufacturers.

These national industries, which came into being for a variety of reasons, have reached different stages of development. In Germany, Salzgitter surface pumps are designed mainly to deal with heavy, viscous crude oils from the German fields and so have a long stroke and slow rotation, whereas most pumps made by Legrand in the UK are exported to South and Central America where the same problem does not arise, and consequently are of the normal type and rotate more quickly.

Generally speaking, the mission reports the same potential exists in Europe as in the US as far as actual machinery capacity is concerned, i.e., Europe is materially capable of producing the same types of equipment as the US.

Achema XI

Frankfurt Exhibition a Great Success

A LARGE American circus used to advertise itself as 'The Greatest Show on Earth,' and visitors to the Achema XI this week seemed agreed that this exhibition could easily adopt the title 'The Greatest Industrial Exhibition in the World.' Blasé journalists from 13 countries—even those from the US—were agreed that no country in the world had ever staged an industrial exhibition on such a large scale or one which was so well organised. Certainly no chemical plant exhibition such as this had ever been seen by any of those present.

The 11th Chemical Apparatus and Equipment Congress and Exhibition was organised by the Deutsche Gesellschaft für Chemisches Apparatewes and is being held in the Exhibition and Trade Fair Grounds of the city of Frankfurt am Main in Western Germany. It opened officially on 14 May and closes at 6 p.m. on 22 May. More than 750 firms from 12 different countries are exhibiting on an area of about 540,000 square feet in 13 large exhibition halls. At the Press reception on 13 May, 250 journalists from 14 countries—including Canada, Spain, Egypt and the US—were present, and at the official opening on the following morning over 2,000 visitors from 44 foreign countries were in attendance. In the evening 2,500 delegates and their ladies packed the Palmengarten at a reception. Almost 300 British visitors applied for tickets to attend Achema XI and more than 100 Americans will have visited the congress before Sunday.

A large number of meetings and lectures are being held in conjunction with the exhibition. These include 19 plenary and 58 ordinary lectures arranged by the European Federation for Chemical Engineering. The speakers come from 16 different countries, including the US, Britain, Sweden, France, Belgium, Holland, Italy, India, Denmark and Switzerland. Works visits to several large plants in the Frankfurt area have also been taking place as well as a full social programme.

Amongst the exhibitors at the exhibition were several British firms and all of them were agreed when interviewed by THE CHEMICAL AGE early this week that their journey to Frankfurt had not been wasted. American exhibitors were equally enthusiastic. Two foreign scientific societies—The American Chemical Society and the Societé de Chimie Industrielle of Paris—were represented. Space will not permit our reporting in detail on either the exhibiton or the chemical engineering conferences in this week's issue, but a fuller report will appear at a later date.

Chaos or Co-operation

A BOOKLET entitled 'Chaos or Co-operation,' which explains the background and implications of the recommendations made by the Monopolies Commission on the calico printing industry, has been issued by the Calico Printers' Association Ltd., and distributed to employees.

In the foreword, Mr. J. F. Simpson, chairman, writes a personal message in which he says that the Government's decision to accept the Commission's recommendations might have serious effects upon the industry, the firm and its employees. He calls this decision 'a thoroughly bad one' taken for reasons of political gain, and urges each employee to write to his Parliamentary candidate expressing his anxiety.

The booklet sets out the background to the industry, briefly surveying conditions to-day and the need to maintain quality to combat foreign competition: it outlines the industry's self-protective arrangements and sums up in conclusion the effects on it if the recommendations of the Commission were enforced.

Italian Fibres

SNIA Viscosa Output Rises

TOTAL group production of the Società Nazionale Industria Applicazioni Viscosa of Milan increased by about 20 per cent in 1954. Rayon production increased by 19 per cent and staple fibre by 16 per cent.

The annual report states that during the year continuous attention was devoted to improving the quality of rayon and viscose staple fibres. New lay-outs and conversion of equipment in all plants were carried out, improving quality output and increasing productivity.

The Lilion (continuous filament) plant was completed in 1954, and sales of this polyamidic fibre were developed. 'The quality of our yarn is greatly appreciated by our customers who display keen interest, to a degree that sales fully absorb output capacity,' says the report. A plant is also in operation for the production of Lilion (staple fibre).

New Fibre

The group has started production of a new polyamidic fibre with the name of Rilsan, the polymer of which is derived from castor oil. According to the report, 'all customers who have utilised this fibre consider it the best among all synthetic fibres, both domestic and foreign. Its major assets are: good handle, light weight and softness.' Production so far has been limited by a shortage of available raw material, but steps have been taken to increase supplies.

The Magenta acetate plant, erected with the technological and financial co-operation of Courtaulds, started production during the first few months of 1954. Its output has gradually increased, and during the last few months of the year it almost reached total capacity.

Particular attention was devoted during the year to research covering such synthetic fibres as Lilion, Rilsan, etc. In addition work has been done on 'the full cycle of production of cellulose fibres.' The company has obtained grants jointly with its associate companies, to search for hydrocarbons in Italy and Sicily. Oil field explorations are also being carried on.

Production of cellulose by the subsidiary, Società Agricola Industriale per la Cellulosa Italiana, was considerably higher in 1954 than in the previous year, and production schedules indicate that the figures should be maintained during 1955.

Production of the SAICI sodium chloride department covered the increased need of Torviscosa for chloride and of the other associated companies for chlorinated products. Some derivatives have also been sold outside the group.

Shell Revenue Up

NET revenue of the Shell Transport & Trading Co. for 1954 amounted to £10,527,844, against £8,670,523 in the previous year. The Royal Dutch/Shell Group, in which the Transport & Trading Co. holds a 40 per cent interest, had a net income of £134,474,218 (£130,413,373).

Sales of the Group increased in volume by nearly 10 per cent outside North America and by 4 per cent in North America. The improvement was particularly marked in Europe, where it is attributable to the record level of economic activity reached during the year.

In his annual statement, Sir Frederick Godber, chairman, says that oil reserves for the future must be sought mainly in remote and inaccessible regions. Year by year the search becomes more hazardous, more difficult and more costly.

As reported last week (p. 1113), the annual meeting of Shell Transport & Trading will be on 1 June.

British Tubes Go West

A BRITISH precision steel tube company is flying out nearly two tons of special process high pressure tube to keep an American chemical plant in production in Houston, Texas. The company is Accles & Pollock Ltd. of Oldbury, Birmingham, who developed the original special process for high pressure tubes used in chemical plant some years ago. They have exported the tubes to countries all over the world, particularly for the construction of plants making polythene.

The American customer is a chemical company which erected its own plant for polythene production in 1953, using American made tubes. Now an urgent appeal has been sent for the British tubes to keep the plant going.

C-I-L Sales Up

Improvement Continued

SALES of Canadian Industries (1954) Ltd. for the first quarter of 1955 were higher than sales for the same operating units for the comparable period of 1954 and continued the improvement evident in the last quarter of 1954, H. Greville Smith, president, told shareholders at the annual general meeting.

'The improvement reflects greater demand for most of our products resulting from the higher level of business and industrial activity than a year ago,' Mr. Greville Smith said. In outlining developments possible for the immediate future, he said that 'studies of ammonia manufacture in eastern Canada have been undertaken with a view to early construction of a plant, if such action appears to be in the company's interests.' Another project under consideration, he said, was the construction of a large sulphuric acid plant to service new mining operations in Ontario.

Referring to the company's expansion programme currently under way, Mr. Greville Smith said that completion of the Cornwall chlorine and caustic soda plant was expected for the end of the year, while the Terylene polyester fibre plant, at Millhaven, Ont., was nearing completion with production from the main units of the plant scheduled for June of this year.

Mr. Greville Smith referred to the introduction in the recent federal budget of the small tariff on polythene resins entering Canada and said that it was gratifying that some recognition had been given to the situation. 'At this stage, however, it is too early to assess what the final effects of the new duty will be,' he said.

In touching on the export situation, Mr. Greville Smith said that Canadian Industries (1954) Ltd. was developing some export business in polythene resins and also in other products through its connection with Imperial Chemical Industries Ltd. 'We are hopeful,' he said, 'that additional foreign demand for the company's products will follow.'

More German Synthetic Fibres

Six German firms plan to be producing 'wool type' synthetic fibres by this summer. Last year Germany produced 7,400 tons of man-made fibres; this year the output is expected to be 9,000 tons.

Liverpool Laboratory

THE Duke of Edinburgh opened the new laboratory of inorganic and physical chemistry at Liverpool University on 11 May, after he had opened the new research station of the British Rayon Research Association at Wythenshawe, Manchester (see p. 1137).

At Liverpool, the Duke referred to the shortage of scientists, particularly science teachers, and said that the opening of the new laboratory was a most important event.

'It also illustrates one of the problems confronting universities and technological institutes, which is how to foresee what the demands are going to be far enough ahead to be able to prepare for them in time,' he went on. 'Techniques are constantly changing in industry, and it is no easy matter to have the particular specialists ready when they are most wanted.'

The Duke added that chemistry was basic to many other sciences and essential to many of the technologies.

Scots Glucose Refinery

A NEW glucose refinery, the first in Scotland, was opened at the Royal Starch Works of Brown and Polson at Paisley by Lord Bilsland, chairman of the Scottish Council (Development and Industry) on 9 May.

Lord Bilsland said he appreciated the honour of being asked to inaugurate the refinery because it was a great, enterprising and significant development made by a company which had always been in the forefront of the chemical industry.

If ever there was an industry of which it could be said that the opportunities were limitless, it was the chemical industry, but unfortunately developments in Scotland were less than the United Kingdom average. Consequently, it was very pleasing to see this new enterprise inaugurated.

UK & US to Enter Canadian Paint Trade

British Paints (Canada), a subsidiary of one of the largest paint-producing concerns in the UK, is to market a full line of British industrial paint products in Canada. With three major US paint firms—Dupont, Valspar and the O'Brien Corporation—planing to enter Canada, competition will be keen in this expanding market.

· HOME ·

British Oxygen Strike

About 600 employees of the British Oxygen Co. went on strike on 16 May for higher pay. The men concerned are employed at depots at Greenwich, Wembley and elsewhere in the Home Counties.

Laboratories Contract

Baird & Tatlock (London), Ltd., announce that they have received a contract to furnish the laboratories of the Luton & South Bedfordshire College of Further Education. This contract is valued at £26,900.

Textile Institute Annual Conference

At the 40th annual conference of the Textile Institute being held at Caxton Hall, London, from 17 to 20 May, the attendance of over 400 has only twice been exceeded; at Edinburgh in 1952 and at Scarborough last year.

Imports Freed

A number of imports from non-dollar, non-sterling countries, mostly in Western Europe, have been added to the Open General Licence. This means they can be imported without restriction of value or quantity and without separate import licences. The products include calcium superphosphate and other phosphatic fertilisers and certain chemicals.

Pyrex Scientists' New Success

For the first time in this country a heat-resisting glass tube with a diameter of 4 in. has been successfully 'pulled' on a machine after several months' research and experiment by the James A. Jobling Co. Ltd., of Sunderland, makers of Pyrex glass. Made in lengths up to 6 ft., the tubing is designed mainly for use in chemical plants for conveying acids, liquid foods and milk, etc.

Reservoir Plan Includes Know Mill

The decision of the Bolton Corporation to develop the Wayoh reservoir as a protection against summer droughts means that the Know Mill Printing Co. Ltd., a subsidiary of Simpson & Godlee Ltd., of Manchester, will have to close. Opened in 1879, the Know Mill bleaches and dyes about 2,000 tons of fabric a year. The Bolton Corporation scheme for increasing the reservoir's capacity means flooding the Know Mill and 47 acres of land.

Silicones for Manchester

The Midland Silicones Ltd. exhibition, 'Silicones for Industry' will be held at the Midland Hotel, Manchester, from 13 to 18 June. It will open on the Monday from 2.30 p.m. and after that from 10 a.m. to 6.30 p.m.

Extruded Thermoplastics

Marley Extrusions, of Riverhead, Sevenoaks, Kent, are open for capacity production of extruded thermoplastics for all industries. Extrusions in any quantity can be produced, pipes up to 6 in. diameter, and sections up to 6 sq. in.

More Gas By-Products

Production of by-products of the gas gas industry rose in the nine months ending 31 December 1954, according to statistics issued by the Gas Council. Crude tar output was up by 1½ per cent and crude benzole output by 8½ per cent.

Courtaulds Research Laboratory

A new viscose research laboratory has just been completed at the Coventry plant of Courtaulds. Built at a cost of £400,000, its main objects are to effect major improvements in the properties of viscose fibre and to develop new methods of manufacture. The staff numbers 400.

Pig Iron & Steel Production

The Iron and Steel Board announce that steel production in April averaged 393,400 tons a week. This is the highest production ever achieved in April and compares with an average of 368,300 tons in April, 1954. In both cases production was affected by the Easter holidays. Pig iron production averaged 238,500 tons a week compared with an average of 212,700 tons in April, 1954.

Photography Exhibition

About 33 per cent of the photographs to be exhibited at the National Exhibition of Professional Photography which opened on 11 May until 7 June at the RBA Galleries in Suffolk Street, London, are devoted to industry. Among exhibitors are: The Shell Photographic Unit, Dunlop, British Insulated Callender's Cables, British Oxygen Company, The 600 Group, and May & Baker.

• OVERSEAS •

Swiss Lead in Fibre Consumption

Switzerland was on average the largest consumer of artificial fibres in 1953, using rather more than 7 lb. per head of population. Britain and West Germany both used about 6 lb. per head.

Protein Fibres Production

Total world production of synthetic protein fibres rose in 1954 to about 445,500,000 lb. This compares with the 1953 figure of 384,840,000 lb. in 1953. Biggest producer was the US (330,000,000 lb.), followed by the UK (25,200,000 lb.).

Fall in World Rayon Output

Estimated world production of rayon in 1954 amounted to 2,029,060,000 lb. compared with 2,082,003,000 lb. in 1953. The drop was almost entirely due to a decline in output in the US, by far the largest producer. Production there fell from 885,836,000 lb. to 693,000,000 lb. Output in the UK, in second place, went up from 206,351,000 lb. to about 220,000,000 lb. More was also produced in most other countries, the most important of which, in descending order, were Japan, Italy, West Germany and France.

Chemical Progress Week

A 'Chemical Progress Week' is being held this week (16 to 21 May) in the US.

Canadian Synthetic Textile Slump

The Canadian Silk & Rayon Institute reports that the synthetic textile industry in Canada showed no signs during 1954 of the 'growth factor' generally associated with the industry elsewhere. The slump, which became evident in 1950, continues in contrast to the world output of man-made fibres which has almost doubled from 1950 to 1954.

Indo-US Agreement

Under an agreement signed in New Delhi on 24 March, the US will subsidise the purchase by India of fertilisers to the extent of $4,000,000. India will also make a contribution to cover internal costs of handling and transportation. The money will be used for the purchase of ammonium sulphate-nitrate, ammonium sulphate, urea and nitre-chalk (ammonium nitrate limestone).

Cheaper Atomic Power

The Foster-Wheeler Corporation of New York has announced an advanced type of nuclear power plant it has perfected at a cost that will be competitive with some conventional power station costs. According to a company official, the plant will utilise the aqueous homogeneous power breeder system which the United States Atomic Energy Commission, in a report to Congress, had favoured as a long-term possibility.

Exports from Israel

The Israel firm, Fertilisers & Chemicals, have received contracts for the export of chemical products and pyrites to a total value of $2,000,000 so far this year. The chemical products include ammonium phosphate, superphosphate and potassium sulphate.

SA Crude Vermiculite Exports

South African exports of crude vermiculite to non-United States markets have risen from 15,000 tons in 1951 to 40,000 tons this year. In spite of the fact that South African vermiculite costs 50 per cent more at Palabora than American crude at the American mines in Montana and the Cardinas, the purity of the ore, greater yield of low-density nuggets, and its lighter colour enables South African producers to develop growing markets overseas.

In the US, 200,000 tons of vermiculite are used each year, and the import of South African crude vermiculite totals 30,000 tons a year, which is bought for its quality.

MIT Summer Programmes

Massachusetts Institute of Technology announce that two two-week special summer programmes will take place during the 1955 summer session. They will be 'Separation by Diffusion Processes' from 20 June to 1 July, and 'Colloid Science' from 11 July to 22 July.

New Microscopic Oil Filter

The Micro Bronze Filter Corp., of Los Angeles, US, has made a permanent all-metal oil filter of sintered bronze which it claims will screen out abrasives and metal particles as small as .000039 of an inch. It contains a patented acid neutraliser to offset the acid solution created by gasoline.

· PERSONAL ·

At the 32nd annual general meeting of the British Chemical & Dyestuffs Traders' Association on 17 May, the following officers were elected: *president*, MR. G. S. BACHE; *vice-president*, MR. C. W. LOVEGROVE; *chairman*, MR. C. V. F. BLAGDEN; *vice-chairman*, MR. H. R. PETERS; *hon. treasurer*, MR. IAN D. ORR, A.M.I.M.M.; *executive council*, MR. L. S. HESKINS (R. W. Greeff & Co.), MR. L. A. QUICK (Langley-Smith & Co.), BRIGADIER C. NORTON STAFFORD, C.B.E., T.D. (C. Tennant Sons & Co.), MR. C. H. WILSON (Cole & Wilson), MR. K. WILLIAMS, F.C.I.S. (KW Chemicals); *hon. auditor*, MR. R. HEAP, F.C.R.A.

New chairman of the Institute of Packaging is MR. HARRY JEFFORD, director of a Midlands export packing and casemaking firm. MR. A. FRASER MUCH, packages and handling adviser to I.C.I., was unable to accept the normal progression from the vice-chairmanship to the chairmanship because of a new appointment with I.C.I.

MR. T. A. DRYDEN, of T. Dryden Ltd., Greenfield Chemical Works, Landore, Swansea, was re-elected chairman at the recent annual general meeting of the British Laboratory Ware Association Ltd. Other elected members are: *vice-chairman*, MR. A. A. WALKER (Southall Bros. & Barclay Ltd.); *treasurer*, MR. N. MCKINNON WOOD (Griffin & George Ltd.); *members of council*, MR. J. E. C. BAILEY, C.B.E. (Baird & Tatlock (London) Ltd.); MR. T. H. HOPPER (Middleton & Co. Ltd., MR. R. J. MACINNES (Scientific Supplies Co. Ltd.), MR. J. G. MALPASS (W. Finlayson), MR. C. PRESTON (J. Preston Ltd.), MR. W. H. NICOLSON (W. B. Nicolson (Scientific Instruments) Ltd.).

Two recent appointments to the staff of Lederle Laboratories Division (Cyanamid Products Ltd.), of London, are MR. J. H. TAYLOR, M.R.C.V.S., as veterinary adviser, and MR. TONY IRWIN as assistant sales manager. Mr. Taylor has recently been conducting trials with antibiotic feed supplements at the Agricultural Research Council's field station at Compton, Berkshire. Mr. Irwin's appointment makes him responsible for marketing Aurofac 2A, the aureomycin feed supplement, in the UK.

The Warner Memorial Medal, awarded by the Textile Institute in recognition of outstanding work in textile science and technology, the results of which have been published, and particularly for work published in the *Journal of the Textile Institute* is to be conferred upon DR. N. H. CHAMBERLAIN, B.Sc., Ph.D., F.T.I., senior lecturer in rayon technology in the Department of Textile Industries at the University of Leeds. The medal was inaugurated in 1930, in memory of the late Sir Frank Warner, a past-president and chairman of Council of the Institute. It will be presented to Dr. Chamberlain at the autumn convocation of the Institute, to be held at Institute headquarters on 4 November.

At the annual general meeting of the British Electrical Development Association, in London, the RIGHT HON. VISCOUNT CHANDOS, D.S.O., M.C., was appointed president of the Association for the year 1955/56, in succession to SIR JOHN HACKING, M.I.E.E.

Hathernware, the industrial ceramic engineers of Hathern, near Loughborough, Leicestershire, announce that following the retirement of MR. C. E. TAYLOR, the vacancy created on the board has been filled by the appointment of MR. N. TANNER.

On 2 May MR. W. HAMILTON was appointed sales manager of the engineering division of Sheepbridge Equipment Ltd. which makes mining and chemical plant equipment. Twiflex Couplings Ltd. (Twickenham), another Sheepbridge company, has appointed MR. W. J. RICKARD midland area engineer.

MR. D. N. MANTON has joined APV-Paramount Ltd., Crawley, Sussex, as Midland area representative. Mr. Manton is well known in the Midlands, as he was senior representative of the Sandwell Engineering Co. Ltd., West Bromwich. MR. E. L. ILLSEY is now representing the same company in the North of England. Mr. Illsey was formerly area manager of Accles & Pollock Ltd.

At the annual general meeting of the British Chemical Plant Manufacturers' Association held in London on 10 May, MR. W. J. HOOTON (S. H. Johnson & Co. Ltd.), the retiring chairman, was re-elected. Elected council members are: MR. P. D. DOULTON (Matthew Hall & Co. Ltd.), MR. H. W. FENDER (Prodorite Ltd.), MR. E. S. FRANKLIN (Torrance & Sons Ltd.), DR. M. GUTER (Costain-John Brown Ltd.), DR. R. LESSING (The Hydronyl Syndicate Ltd.), MR. G. W. RILEY (George Scott & Son (London) Ltd.), MR. R. W. RUTHERFORD (The Power Gas Corporation Ltd.), MR. P. W. SELIGMAN (The APV Co. Ltd.), MR. R. F. STEWART (Dorr-Oliver Co. Ltd.). The council elected three vice-chairman: MR. H. W. FENDER, MR. I. M. O. HUTCHISON (Henry Balfour & Co. Ltd.), and MR. R. W. RUTHERFORD. Elected treasurer was MR. P. W. SELIGMAN.

MR. HAROLD SAGAR, F.R.I.C., of Bury, at present deputy head of the Fibre Evaluation Section of I.C.I. Ltd. (Dyestuffs Division), has been elected a Fellow of the Textile Institute. Ten new Associates have also been elected.

Metal Industries Ltd. announce the appointment to the board of MR. J. O. KNOWLES, chairman and joint managing director of Brookhirst Switchgear Ltd., and MR. J. T. RYMER, director of Sentinel (Shrewsbury) Ltd. Both will maintain their connections with these two member companies as chairmen. SIR CHARLES WESTLAKE, chairman of the Uganda Electricity Board, has also been appointed to the board of MI. After 33 years as managing director, and latterly as chairman, MR. R. W. CRONE has retired from the board. The directors recommend that Mr. Crone be appointed an honorary president. MR. J. S. HUTCHISON has been appointed to succeed Mr. Crone as chairman.

The 43rd annual general meeting of the British Engineers' Association, with president, H. S. 'DICK' BROOM, M.B.E., in the chair, was held on 12 May. As a result of the ballot for election to the governing council of the Association, MR. W. T. TOWLER, J.P. (Towler & Son Ltd.) and MR. G. S. WOOD (Thos. W. Ward Ltd.) were elected.

At the annual meeting of the Council of the Association of British Pharmaceutical Industry held on 5 May, the following officers were appointed for 1955-56: *President*, MR. C. M. HILL (British Drug Houses); *vice-president*, DR. T. H. M. KERFOOT (Thomas Kerfoot & Co.); *hon. treasurer*, MR. G. T. MORSON (Thomas Morson & Son). MR. H. C. H. GRAVES (Vitamins Ltd.), hon. treasurer of the Association since 1 January, 1948, was unable to stand for re-election because of business commitments. Council recorded it appreciation of the services rendered by Mr. Graves and co-opted him to the Council.

MR. L. C. KEMP, JR., has been appointed general manager of The Texas Company's newly-established petrochemical department. The Texas Company is planning to expand its petrochemical activities in order to take advantage of developments by its research organisation and provide for more profitable utilisation of certain materials available from its refining operations.

A native of Houston, Texas, Mr. Kemp holds a degree in chemical engineering from Rice Institute. He joined The Texas Company in 1929 as a research chemical engineer at the refining department's Port Arthur Works, Port Arthur, Texas. He has served in various managerial capacities in the research field, and was director of research for the company from 1941 to 1953. His headquarters will be in New York.

Wood Preservative for UK

THIRTY years of research on a termite station at the Rheinberg factory of Desowag Chemie-Gesellschaft, Dusseldorf, resulted in the manufacture of Xylamon, a widely-used wood preservative now available here.

The product has as its base the synthetic chemical, chloronaphtalene, to which patent-protected toxics have been added. It is said to be 100 per cent active—no insects or fungi can resist its effect.

The product is non-inflammable, non-corrosive, water-insoluble and water-repellent. It does not choke the pores of the wood, and being free from tar, after sufficient time has been allowed for complete absorption into the timber, it can be painted, polished or lacquered. The preservative is unaffected by heat or frost, and does not stain cement, brick, stone or metals. It is neither acid nor alkaline. British distributors are Silexine Paints Ltd.

Publications & Announcements

PRAT-DANIEL Ltd., Dalston Gardens, Stanmore, Middlesex, have published a leaflet P.33, giving details of the fans and dust collectors which they manufacture. They claim that the tubular style of dust collector is the most efficient because of special features embodied in their design. Examples are given of the application of these installations to boiler houses and foundries.

* * *

CORROSION of metals in contact with emulsion and water based paints may be reduced to almost negligible amounts by the addition of a small quantity of sodium benzoate. An account of experimental work that has been done on this problem is contained in a booklet published by Monsanto Chemicals Ltd., London S.W.1. Tinplate is the basis of many paint containers and 'pinholing' often leads to corrosion and subsequent deterioration and discoloration of the paint. It has been found that the addition of 0.5-2 per cent of sodium benzoate will inhibit all such corrosion. In paints of a slightly acidic nature it is beneficial to add a small quantity (0.1-0.2 per cent) of sodium nitrite. Photographs are reproduced showing the effect of immersing tinplate in a polystyrene emulsion paint containing various quantities of sodium benzoate. Where the quantity of sodium benzoate exceeds 1.0 per cent there is no corrosion at all. Examples are also given of the use of benzoic acid for improving the quality of alkyd resins and of finished varnishes, paints and enamels.

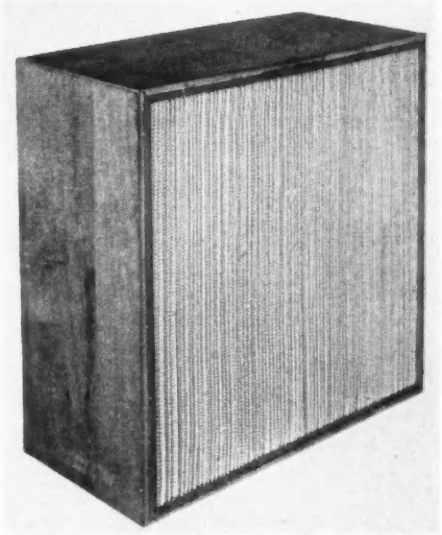
* * *

SOMETIMES it is found that the dust separation provided by the normal high efficiency filter is inadequate for certain applications, such as photographic, pharmaceutical, bacteriological or atomic energy work. In such cases particles between 0.1 and 5 microns can cause trouble, and to meet these new requirements, special high efficiency filters have been devised, taking one of three basic forms:

(a) Units employing a relatively thick layer of composite material.

(b) Units whose retention efficiency is enhanced electrostatically by impregnation of the fibres with resinous materials.

(c) Units employing specially developed paper media containing sub-micronic fibres, which operate on a combined depth-surface bed principle.



Type (a) is extremely efficient but has a minimum arrestation size, probably of the order of 0.1-0.5 micron, and particles lying within this range will show least tendency to be collected. In type (b) the electrostatic properties are found to fall off with time. The Vokes 55 'absolute' air filter, made by Vokes Ltd., Henley Park, Guildford, is of type (c). It has been made possible by recent developments in paper manufacture, in which a dispersion of extremely fine asbestos fibres is made in relatively coarse cellulose fibres, in this case from esparto grass. The advantage of this material is that it enables a large filtration area to be contained in a very small space. The efficiency of this design has been tested using methylene blue and di-octyl phthalate dusts clouds and has been found to be, initially, 99.95 per cent. The efficiency rises steadily as dust accumulates on the paper. The paper panels fit into a wooden frame from which they can be removed without direct handling, an important point where radioactive dust is involved. The whole unit may be disposed of by incineration if necessary.

ADVICE on methods of ensuring satisfactory results in polystyrene moulding processes is contained in a booklet, 'A Code of Practice for the Annealing of Polystyrene Mouldings', published by the British Plastics Federation (4s. post free from British Plastics Federation, 47-48 Piccadilly, London W.1). The use of polystyrene as an injection moulding material has greatly increased in the last ten years, with mouldings becoming larger and more intricate, and the report follows the appointment of a special sub-committee of the Technical Committee of the Injection Moulders' Section of the Federation in 1952. Factors which contribute to the crazing of polystyrene in the normal processes of moulding are described and also methods of relieving, by annealing, the strains which may result from the type of material used (with particular reference to its monomer content) and the strains which may result from the use of solvents in assembly work. Practices are detailed in the actual process of moulding which, by suitable modification, can assist in preventing the setting up of strain.

* * *

THE Tin Research Institute announces in its quarterly journal that it is organising an international exhibition, 'Pewter of Today', in June this year, to take place in London. Exhibits are being lent by firms in most of the pewter-producing countries. After the London showing the collection will tour European and American cities. Dr. Frederick Lowenheim explains in a four-page article how it is possible to step up the production from stannate tin-plating baths by substituting the sodium salts by potassium salts. He also describes a patented tin-alloy anode that aids in faster plating. Chemical balance weights are now being plated with the new tin-nickel alloy electroplate; according to the article, the tin-nickel plating is preferable to gold plating for this application. The journal, *Tin and Its Uses, No. 31*, is obtainable free on request to the Tin Research Institute, Fraser Road, Greenford, Middx.

* * *

BRITISH Drug Houses Ltd., Poole, Dorset, are in the process of re-labelling some 1,500 items in the range of BDH laboratory chemicals. The new grey-green labels give details of minimum assay and the maximum limits allowed of significant impurities. This information is contained in the BDH catalogue for 1955. Since this new development is not yet complete, however, it was decided not to distinguish substances which do or will carry specification labels from the rest. Provision for this will be made in a later issue. No change in the quality of a reagent is to be inferred from the appearance of a specification label and these labels merely codify the standards that BDH analysts have previously worked to.

* * *

'SCIENCE News' No. 36 contains articles covering a wide range of subjects. These include 'The Size of Atomic Nuclei,' 'Sulphur in Pictures,' 'Brittle Fracture of Structural Steel' and a research report which describes, among other things, the development of nuclear power.

* * *

LEDA Chemicals Ltd., Angel Road, Edmonton, London N.18, are issuing loose-leaf folders containing brief descriptions and suggested uses for their range of chemicals. Dodecyl pyridinium chloride is used in the viscose rayon industry for the prevention of clogging of the spinnerettes (USP. 2,125,031). It can be added as a 10 per cent solution in water and is used up at the rate of 0.4 g. per 1,000 g. of rayon. Leda Stebac, an emulsion of 4-5 per cent stearyl alcohol in stearyl dimethyl benzyl ammonium chloride solution, is widely used as a hair softener after a cold permanent wave. Also available are solutions of anhydrous HCl in organic solvents, alkyl chlorides, rubber chemicals and agricultural fungicides.

* * *

'CONTROL of Variables in World Industry' describes the wide range of measuring and control instruments made by George Kent Ltd., of Luton, Beds. Type M meters, for the domestic user, will begin to record at $\frac{1}{4}$ gallon per hour and are guaranteed to within 2 per cent down to 3 gallons per hour. Kent meters are used extensively in the petroleum industry, ranging from the great oilfields and refineries to the local garage. The industrial measurement of *p*H demands equipment which is robust and reliable and it is claimed that the Kent Universal Glass-Electrode fulfils these requirements. It can operate in liquids up to 100° C or 75 psi. Equipment is also manufactured for the control of boiler pressures, fuel supplies, steam temperatures, draught, etc.

ACETONE

ISOPROPYL ALCOHOL

Availability:

These high quality chemicals, manufactured at Billingham from propylene produced in the oil-cracking plant at Wilton, are available in road tank-wagons and drums.

ICI

For further information, consult:

IMPERIAL CHEMICAL INDUSTRIES LTD.,

LONDON, S.W.1

B.243

Company News

Consolidated Zinc Corporation

The Consolidated Zinc Corporation announces that a new company, Interstate Oil, has been formed in Australia by Consolidated Zinc Property, a subsidiary of the CZC, to acquire and hold approximately the whole of the one-third interest of the group in Frome-Broken Hill. This company is making an issue of 2,000,000 shares of 5s. each at par, 51 per cent of which will be taken up by Consolidated Zinc Property. The remaining 980,000 shares will be offered to ordinary shareholders of Consolidated Zinc and the Australian public. Conditions in the area acquired by Frome-Broken Hill in 1954 are considered favourable enough to justify drilling a test well to be started in June. Emphasising the importance of searching for oil in Australia, the directors point out that the venture is attended by many risks.

Consolidated Pneumatic Tool Co.

It is announced by the Consolidated Pneumatic Tool Co., of 232 Dawes Road, London S.W.6, that they have entered into an agrement to take over virtually world-wide representation for the Hemborn range of dustless dry drilling equipment. Certain continental territories are, for the time being, excluded from the new arrangement, but immediate selling plans are being made in respect of the United Kingdom, British Dominions and many other overseas areas.

Olin Mathieson Chemical Corporation

Domestic and Canadian sales of Olin Mathieson Chemical Corporation for the first quarter of 1955 were $121,175,381—9.7 per cent above those of last year.

Newton, Chambers & Co.

In spite of more intensive competition in all fields Newton, Chambers & Co. more than maintained its record turnover during 1954 and increased its profit. Net profit, after tax, was £306,505, against £145,175 in 1953. Although the Chemicals Division was handicapped by a shortage of paper, sales turnover was slightly higher than the record figure of 1953. This enabled the Division to absorb increases in costs of wages and raw materials without increasing the price of its products.

British Drug Houses

Home sales of medicinal chemicals and preparations by British Drug Houses were substantially the same last year as they had been in 1953, says the annual report. Competition has continued to increase, and the selling prices of unbranded drugs and chemicals have shown a downward tendency. Total sales increased slightly. About 44 per cent of them were in overseas markets. The Poole factory, which manufactures laboratory and non-medicinal chemicals, is making steady progress, particularly in the sale of bulk chemicals to industry. Consolidated net profit, after tax, was £216,531, against £124,695, and in view of the improved results, the directors recommend a 15 per cent dividend with a 2½ per cent bonus. This compares with 12½ per cent last year. Sales so far this year have shown some increase over last year, especially in the export market and in laboratory and non-medicinal chemicals.

Hickson & Welch (Holdings)

The directors of Hickson & Welch (Holdings) have declared an interim ordinary dividend of 4 per cent, less tax, on the issued ordinary share capital of company amounting to £12,650. This compares with the previous interim of 3½ per cent, less tax, but the dividend now declared is payable on capital increased by the issue of 300,000 ordinary shares of 10s. each.

Thomas Hedley & Co.

Operating profits of Thomas Hedley & Co., and the British subsidiary of Procter & Gamble in the year ended 30 June 1954, totalled £2,202,541, compared with £2,438,689 in 1953. The net profit is £1,150,987, against £1,350,625, and the dividend is repeated at £600,000 for the year.

The directors said that although the profit earned was not large when related to the volume of business, it was satisfactory, for in addition to making provision for expansion, reasonable dividends have been paid for the last two years.

Stream-Line Filters

An offer of 47s. 6d. per 5s. share for the purchase of all the £100,000 issued one-class ordinary capital of Stream-Line Filters which is now pending, would involve a total payment of £950,000. It is hoped that the formal offer, to be conditional upon 90 per

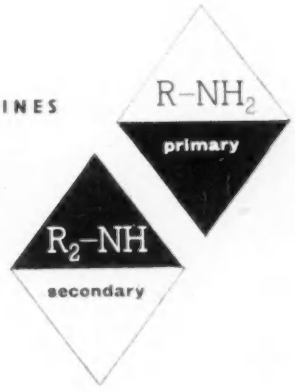
continued on page 1164

HIGH MOLECULAR WEIGHT ALIPHATIC AMINES

armeens

AND AMINE ACETATES

armacs



The Chemical Division of Armour & Co. Ltd. have detailed technical information on applying their ARMEENS and ARMACS in many industries. We may have a ready-to-use formula to fit your case.

ARMEENS are a range of primary aliphatic amines RNH_2 or secondary aliphatic amines R_2NH in which R represents pure or mixed fatty acid radicals. *Armeens* are strongly cationic and water repellent, and dissolve in oils and most solvents. They are substantive to metals, pigments, fibres, paper, glass, masonry, stones, plants, synthetic resins, etc. They are capable of additive and other chemical reactions.

ARMACS are the acetate salts of the ARMEENS and are water soluble. In all other respects they resemble the Armeens.

ARMEENS and ARMACS will shortly be produced together with other ARMOUR CHEMICALS in the United Kingdom. Samples and experimental lots are available now. Write to us on your business paper.

ARMOUR & COMPANY LTD., Chemical Division, Lindsey St., London, E.C.1

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Company News

continued from page 1162

cent acceptance, will be received in time for details to be made known in the 1954 accounts in the first week in June.

Shareholders, meantime, have been advised by the board not to dispose of their holdings. A further interim dividend of 12½ per cent and a 20 per cent bonus are now declared for 1954, which vendor shareholders would receive. As expected by the board, profits have fallen from the 1953 record level, the group net balance being £110,758, compared with £164,900 after charging taxation of £106,619, against £259,033.

Greeff-Chemicals Holdings

Greeff-Chemicals Holdings recommend a final dividend of 13¾ per cent, making 17½ per cent, less tax, on the £400,000 ordinary for the year. This compares with the forecast of a total of not less than 12½ per cent for the year. Group profit, before tax, rose from £86,416 to £134,916 for last year. Tax takes £68,910 (£43,102) and general reserves receives £22,000 (£12,000). Ordinary dividend requires £39,875, against £27,500, and carry forward is £20,004 (£19,655). The meeting will be on 20 June with Mr. S. B. Smith as chairman.

Next Week's Events

MONDAY 23 MAY

Chemical Society

Sheffield: Chemistry Lecture Theatre, The University, 7.30 p.m. Centenary lecture: 'Some Chemical Effects of Steric Strains' by Professor H. C. Brown.

TUESDAY 24 MAY

Institution of Chemical Engineers

London: Royal Institution, 21 Albemarle Street, Piccadilly, 5.30 p.m. 'Mechanism of Fluidisation of Powders in Gases' by Professor Warren K. Lewis.

WEDNESDAY 25 MAY

SCI (Food Group)

London: National College of Food Technology, Cranwood Street, City Road, E.C.1, 6 p.m. Short papers by members of the group, followed by tour of the college.

Society for Analytical Chemistry

Birmingham: Chemistry Department, The University, 3.30 p.m. Assemble for tour of organic and analytical research sections, followed (at 6 p.m. in main lecture theatre) by four original papers on the use of a new reagent for the determination of sulphate.

British Ceramic Society

Harrogate: Hotel St. George, 3 p.m. Opening of spring meeting of Refractory Materials Section (until 27 May).

THURSDAY 26 MAY

Chemical Society

Manchester: Chemistry Lecture Theatre, The University, 6.30 p.m. Centenary lecture: 'Chemical Effects of Steric Strains' by Professor H. C. Brown.

Market Reports

LONDON.—A good movement against contracts has been reported from the industrial chemicals market during the past week. Inquiries for new business are about the average for the period and export orders are keeping up to a satisfactory level. No important price changes have been reported on the week and the undertone of the market is firm. The coal tar products market is steady both as regards quotations and conditions.

MANCHESTER.—Inquiry for heavy chemical products during the past week has been fair, and a steady flow of replacement business in alkalis and other leading 'heavies' is reported by traders. There has been no apparent relaxation on pressure for contract deliveries, although the outlook in cotton bleaching and allied industries is uncertain. Values remain on a steady to firm basis. In the fertiliser market there is a fair movement of supplies in several sections, including sulphate of ammonia and compounds, while a steady demand of most of the tar products is reported.

GLASGOW.—Conditions in the Scottish industrial chemical market have been steadier during the past week. Orders received have been mostly against normal requirements. Prices on the whole are reasonably steady, but in some cases there has been an upward tendency due to increased carriage charges. No change has to be reported for agricultural chemicals for which the demand is still being maintained. The export market still continues to be satisfactory.

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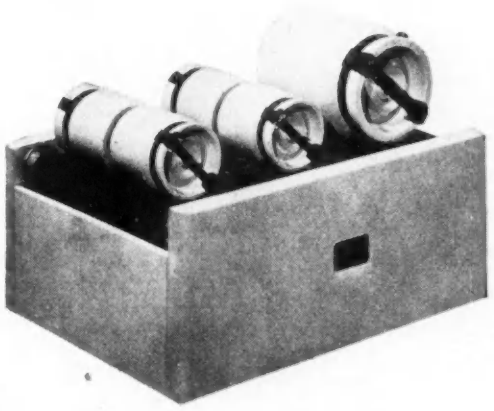

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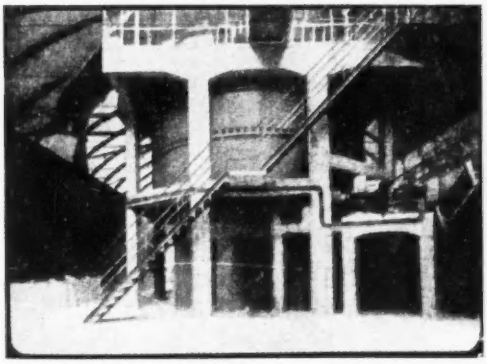

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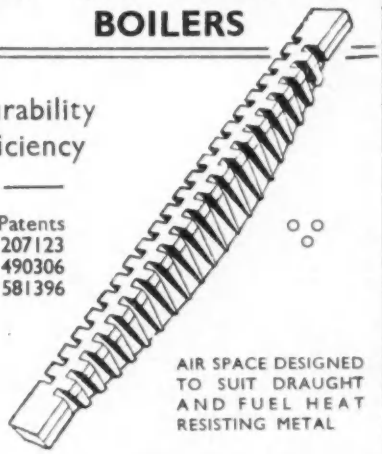

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INDEX to advertisers in this issue

	Page
Armour & Co., Ltd.	1163
Ciech, Ltd.	1127
Classified Advertisements	1166, 1167, 1168
Collins Improved Firebars, Ltd.	1169
Geigy Pharmaceutical Co., Ltd.	1128
Girling, S., & Sons (Coopers), Ltd.	1169
Imperial Chemical Industries, Limited	1161
Imperial Chemical Industries, Limited, Plastics Division	1123
Key Engineering Co., Ltd. (The)	Cover ii
Lennox Foundry Co., Ltd.	1170
Lord, John L.	Cover iv
Manlove Alliott & Co., Ltd.	Cover iii
Measuring & Scientific Equipment, Ltd.	1126
Metal Containers, Ltd.	Front Cover
Metropolitan-Vickers Electrical Co., Ltd.	Cover iv
Mond Nickel Co., Ltd. (The)	1125
Morgan Crucible Co., Ltd. (The)	1130
Moritz Chemical Engineering Co., Ltd. (The)	1165
National Enamels Ltd.	Cover ii
Pascall Engineering Co., Ltd. (The)	1165
Shell Chemicals, Ltd.	1124
Tarslag Ltd.	1169
Walley, A. L.	1126
Wells, A. C., & Co., Ltd.	Cover ii

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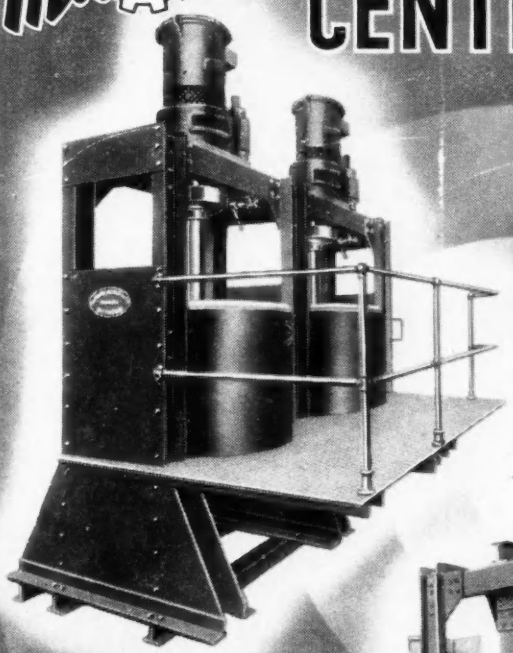

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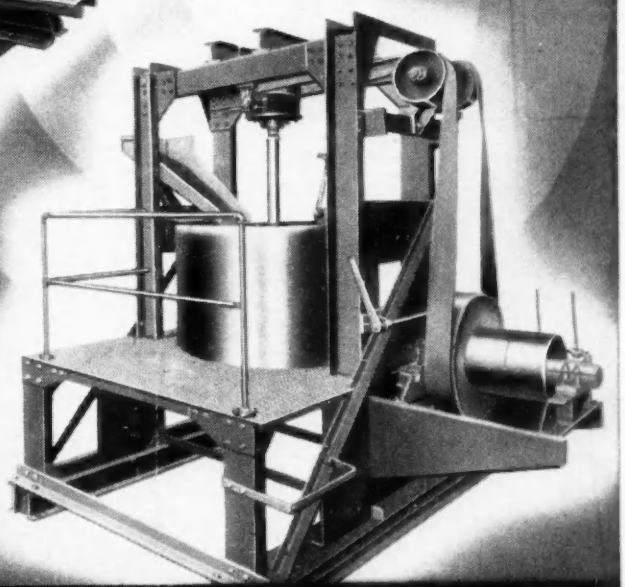

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